International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-1, November 2019

Statistical Analysis of Impact of Strategy & Flexibility on Supply Chain Performance in the Perspective of Indian Automobile Manufactures

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Abstract*: *Today's business under competitive environment, the organizations must be integrated and maintain their business deliberately within the supply chain network. With the intention to indentified the impact of supply chain strategy (SCS) and supply chain flexibility (SCF)) on performance in a sample of the automobile industry and investigate the direct influence of dimensions of SCS and SCF on performance. With the help of quantitative research, a survey was conducted. Statistical tools were used to investigate the information. The structural equation path modeling approach is used to assess the relationship of the hypothesis. The findings analyzed that SCS and SCF positively influence performance. The result finds an encouraging relationship between SCS and SCF with supply chain performance (SCP) and the result indicate that effective and efficient supply chain flexibility has a positive impact on the firm's performance. The result also shows that supply chain strategies are related to performance.

Keywords: Supply Chain Management (SCM), Supply Chain Strategy (SCS), Supply Chain Flexibility (SCF).

I. INTRODUCTION

Companies try to archive strategic advantages their rivals through proper execution of practices of SCM. All the tools used in SCM improve the efficiency of information sharing between the supply chains (SC) partners and ensure the smooth flow of materials in SC partners and try to make the SC operation cost effective so that all partners make a profit. In today's marketplace, SCM becomes a well-known management concept and having a long research history (Mentzer et al, 2001). It provides ample opportunities to Indian manufactures especially SMEs which are the backbone of industrialization to achieve tactical competitiveness over their rivals through the effective and efficient implementation of SCM practices to achieve high competitiveness amongst SC partners (Chikan, 2008).

Revised Manuscript Received on November 30, 2019.
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SCM nowadays becomes a very crucial and important area of modern management companies design their SCM network as per the need and demand of customer so that they can serve them efficiently and effectively. But proper designing and effective implementation of SCM practices is a big challenge due to shorter product lifespan, quality product at lower price, faster delivery schedule, different variety product and uncertainty in the market (Braunscheidel, 2005). Due to these difficulty companies need to focus on newer and innovative SCM practices which can deal with the uncertain market .Manufacturing companies adopt different SC strategy and their supply chain will be more flexible which can cop-up with uncertainty on demand, supply, and manufacturing. Previous research in the field of SCM clearly shows that there is a relationship between SCM dimensions with firm's performance (Bhasin, 2008) and also advocate the integration of all members of the supply chain to obtain flexibility and speed (Frohlich et al., 2001). The current research aim to construct and test a model which shows that along the tools adopted to manage flow of information, flow of material and flow of money in supply chain to achieve high overall performance in supply chain, managing SCS and SCF is also inevitable in current scenario due to shorter product life cycle, quality product at lower price, faster delivery to customer, increasing variety and uncertainty in market (Braunscheidel, 2005).

II. LITERAURE REVIEW

2.1 Supply Chain Flexibility

The accomplishment of a SC depends largely on SCF which plays a vital role in the proper implementation of the SC. Flexibility in operation creates an opportunity for customers in unique ways. Flexibility is the competence to change or react with time, cost and effort (Upton, 1994). Russell and Taylor (2009) defined supply chain flexibility as an aptitude to regulate with changes in product mix, production volume or design The results show that SCF directly influence performance. The following construct of flexibility considered after literature review: a- Innovative & New Product Flexibility (IF), Product Flexibility (PF), Existing Product Flexibility (EPF), Delivery Flexibility (DF), Information Flexibility (INF). Hence this study, therefore, proposes that:

H_1: SCF has a significant constructive control on performance.

2.2 Supply Chain Strategy

Now-a-day's business environment is extremely competitive and to compete in such competitive situation firms must take up an appropriate and suitable supply chain management strategy as per the market situation. Companies adopt supply chain strategy as per product requirement because in the market the variety of product available hence supplies chain strategy varied from product to product. Supply chain strategy for any product or service depends on supply and demand uncertainty, product lifecycle and manufacturing strategies. Due to these uncertainties, different supply chain strategies emerged (H.L. Lee, 2002). As per Sufian, (2010) information technology should facilitate implementing the business strategy. For taking competitive advantages customer convenience strategies such as customized logistics and agility increase demand while operational strategies and lean network increase supply-side capabilities (E. A. Morash 2001). From theories and literature following dimensions of SCS are included: Innovative Strategy (INS), Customer Oriented Strategy (COS), and Agile Supply Chain Strategy (ASCS). Therefore, it is hypothesized that:

H_2: SCS has a significant constructive control on performance

2.3 Supply Chain Performance

On the other hand in order to measure SMEs performance following supply chain performance construct is operationalized namely cost performance, logistics performance, and quality performance. From theories and literature following dimensions of SCP are included: Cost Performance, Logistic Performance, and Customer Satisfaction Performance & Quality Performance:

III. RESEARCH METHODOLOGY

3.1 Instruments Development

In these research two independent enablers SCS and SFC are analyzed on SCP which is a dependent variable. Data are collected through expert panel through questionnaire which is validated through pilot study.

3.2 Sampling and Data Collection

Data is collected using Questionnaire which was administrated to a total sample of 140 respondents out of 250 questionnaires sent to different respondents. Out of which 140 respondents only 121 responses is in usable form.

3.3 Statistical Analysis

To validate proposed hypothesis a statistical analysis is done. As per following flow diagram (Figure 1).

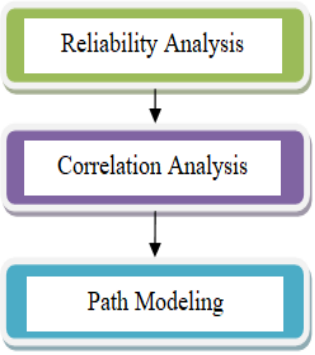

Figure 1: Flow of Statistical Analysis

IV. RESULT ANALYSIS

4.1 Reliability Analysis

All the construct of supply chain strategy has Cronbach's alpha more than 0.7 indicate that all items are reliable. Similarly, all construct of supply chain flexibility and supply chain performance construct having Cronbach's alpha more than 0.7 indicate that all items are reliable and valid for further research. The next analysis of reliability is descriptive statistics with mean; standard deviation and Cronbach's alpha (**α**) are listed in table1

Table 1: Descriptive Statistics for SCS

Types of Construct of SCS	Item	Mean	St. Dev.	α –Value
INS	Q1	4.36	0.782	0.888
	Q2	4.36	0.782	
	Q3	4.49	0.75	
	Q4	4.43	0.79	
COS	Q1	4.44	0.638	0.754
	Q2	4.43	0.831	
	Q3	4.49	0.752	
	Q4	4.35	0.647	
ASCS	Q1	4.36	0.821	0.856
	Q2	4.26	0.815	
	Q3	4.53	0.639	
	Q4	4.43	0.683	
	Q 5	4.32	0.687	

For SCF the descriptive statistics with mean, standard deviation and Cronbach's alpha (α) are listed in table 2.

Table 2: Descriptive Statistics for SCF

Construct of SCF	Item	Mean	St. Dev.	α -Value
NPF	Q1	4.27	0.819	0.863
	Q2	4.29	0.842	
	Q3	4.18	0.827	
	Q4	4.43	0.789	
	Q 5	4.53	0.614	
	Q6	4.33	0.776	
	Q7	4.26	0.843	
PF	Q1	4.44	0.729	0.925
	Q2	4.44	0.791	
	Q3	4.41	0.768	
	Q4	4.35	0.671	
	Q 5	4.36	0.674	
	Q6	4.26	0.755	
	Q7	4.26	0.755	
EPF	Q1	4.35	0.716	0.858
	Q2	4.16	0.674	
	Q3	4.12	0.718	
	Q4	4.07	0.595	
	Q 5	4.35	0.694	
DF	Q1	4.58	0.682	0.915
	Q2	4.46	0.639	
	Q3	4.38	0.629	
	Q4	4.40	0.745	
	Q 5	4.53	0.708	
	Q6	4.44	0.750	
	Q7	4.40	0.680	

INF	Q1	4.26	0.815	0.811
	Q2	4.60	0.580	
	Q3	4.43	0.636	
	Q4	4.16	0.719	
	Q 5	4.47	0.533	

For SCP, the descriptive statistics with mean, SD and Cronbach's alpha (**α**) are listed in table 3.

Table 3: Descriptive Statistics for SCP

Construct of SCF	Item	Mean	St. Dev.	α -Value
CP	Q1	4.38	0.677	0.798
	Q2	4.64	0.597	
	Q3	4.46	0.614	
	Q4	4.58	0.704	
LP	Q1	4.23	0.723	0.824
	Q2	4.12	0.673	
	Q3	4.53	0.686	
	Q4	4.40	0.632	
QP	Q1	4.50	0.615	0.799
	Q2	4.27	0.718	
	Q3	4.47	0.731	

4.2 Correlation Analysis

The correlation SCS and SCP were positive as shown in table 4. On careful observation, all construct of SCS has positively related to all construct of SCP.

Table 4: Correlation Analysis with SCS and SCP

	INS	ASCS	COS	CP	LP	QP
INS	1					
ASCS	0.629 **	1				
COS	0.628 **	0.734 **	1			
CP	0.407 **	0.506 **	0.496 **	1		
LP	0.289 **	0.374 **	0.312 **	0.820**	1	
QP	0.441 **	0.523 **	0.488 **	0.825 **	0.773 **	1

Similarly, the correlation between independent variables SCF and dependent variables SCP were positive as shown in table 5. On careful observation, all construct of SCS has positively related to all construct of SCP.

Table 5: Correlation Analysis with SCF and SCP

	NPF	PF	DF	EPF	INF	CP	LP	QP
NPF	1							
PF	0.697 **	1						
DF	0.630 **	0.853 **	1					
EPF	0.689 **	0.892 **	0.859 **	1				
INF	0.543 **	0.713 **	0.771 **	0.786 **	1			
CP	0.640 **	0.890 **	0.823 **	0.844 **	0.812 **	1		
LP	0.557 **	0.830 **	0.836 **	0.797 **	0.900 **	0.820 **	1	
QP	0.608 **	0.761 **	0.789 **	0.832 **	0.733 **	0.825 **	0.733 **	1

4.3 Path Modeling

An SEM model was employed to explore linkages that allow a researcher to establish the relative strength of relationships between independent (SCS, SCF) and dependent (SCP) variables. The SEM is analyzed through Smart-PLS. The coefficient of determination for cost performance is 0.870, for logistic performance 0.875 and for quality performance it is 0.738.

To test hypotheses H_1 the regression results and the standardized path coefficients representing the direct effects of SCS dimensions on SCP are shown in Table 6. To find the impact of SCS on SCP parameters such as cost performance and the results of current research shows that innovative strategies have a negative impact on cost performance while customer-oriented strategies and agile supply chain strategies have a weak impact on cost performance. The results show that innovative strategy, agile supply chain strategy & trans-shipment and delivery flexibility have a very weak negative impact on logistic performance while the customer-oriented strategy has a weak positive impact on logistics performance. Finally, the results of current research show that the innovative strategy, innovation & new product/future research flexibility sourcing. Flexibility process flexibility put a very weak negative impact on quality performance while customer- oriented strategy & agile supply chain strategy have a weak positive impact on quality performance

Table 6: Total Effects of SCS on SCP

	INS		COS		ASCS	
	Coefficient	t-Statistics	Coefficient	t-Statistics	Coefficient	t-Statistics
CP	-0.090	0.039	0.092	0.968	0.081	2.105
LP	-0.114	0.890	0.146	1.028	-0.081	0.947
QP	-0.050	0.042	0.148	0.163	0.098	0.803

*** 1% significance level. ** 5% significance level. * 10% significance level.

Similarly, to test hypotheses H_2 the regression results and the standardized path coefficients representing the direct effects of SCF dimensions on SCP are shown in Table 7. The result shows that the supply chain flexibility constructs new product flexibility has a very weak negative impact on cost performance while delivery flexibility has a weak positive impact on cost performance. Similarly, sourcing flexibility & existing product flexibility have a moderately positive impact on cost performance while information flexibility a weak positive impact on cost performance. In similar fashion, sourcing flexibility, process flexibility, and existing product flexibility have a moderately positive impact on logistic performance while information flexibility is positive impacted logistic performance and, other Innovation/New Product Flexibilities have no impact on logistics performance. Finally, existing product flexibility & information flexibility have a moderate positive consequence on quality performance and finally, trans- shipment and delivery flexibility has a strong positive effect on quality performance

Table 7: Total Effects of SCF on SCP

	NPF		PF		DF		EPF		INF	
	Coefficient	t-Statistics	Coefficient	-Statistics	Coefficient	-Statistics	Coefficient	t-Statistics	Coefficient	t-Statistics
CP	-0.026	0.442	0.424	2.116	0.319	0.668	0.031	0.816	0.188	2.615
LP	0.000	0.205	0.240	1.607	0.299	2.105	-0.094	0.471	0.559	5.525
QP	-0.056	0.039	-0.083	0.713	0.218	1.109	0.466	3.438	0.235	0.580

*** 1% significance level. ** 5% significance level. * 10% significance level.

V. CONCLUSION

Research conclusion shows that an SCS is a weak relationship to SCP. Although SCS is the weak correlation with performance, firms should take note that SCS is important factors and impacting SCP. However, the top management should be formulated & implemented appropriate SCS into SCM practices (Sufian, 2010). The consequence of this revise may be contributing to the SCM knowledge in several ways. The study Contributes to the field of SCS and practices in the SCM. *First*, it projected a hypothetical SCS framework that identified the "innovative strategy", "agile supply chain strategy", and "customer oriented/satisfaction strategy. *Second*, gives a guideline for managers to audit and assess the impact of strategy and flexibility on SCP. *Third*, it provides theoretical and authoritarian literature on the subject of SCS and SCF. There are a number of limitations of this research.

First, this research restricted to a single sector (Indian automobile industry). Due to these limitations, the conclusions may not be accepted to other sectors. *Second*, the test assortment based on an expediency sample, rather than an arbitrary likelihood sample, which is often used for investigative work. *Third*, in sample single sector industry is covered. *Fourth*, it contain questionnaire which leads to a risk that the response are not biased. Supply chain performance is an important area for a researcher in the supply chain management field.

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