FACTORS RESPONSIBLE FOR FACILITIES OF SCM IN SPONGE IRON INDUSTRIES

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Abstract: Supply chain is a network of facilities and distribution option that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products to customers. It exists in manufacturing as well as service sectors both although the complexities differ from industry to industry. The supply chain is made up of several elements that are linked for movement of products along the chain. The chain ends with the customers. The present context deals with the effectiveness of supply chain considering performance factors associated with it.

Key words: Globalization, SCM, Likert Scale, Principal Component Analysis

1. Introduction

In this Liberalisation, Privatisation, Globalisation and Recession generation, measurement of supply chain performance which differs from firm to firm is a backbone to enhance the efficiency and effectiveness of any manufacturing firm which is applicable to Sponge Iron Industries. In order to achieve the objectives, the following procedure was followed: Factors were hauled out from a review of past studies as well as brainstorming. Based on these factors, a questionnaire was designed and pilot tested by brainstorming. A questionnaire survey was carried out among 31 Sponge Iron Industries personnel in the case. The responses were grouped in a principal component analysis to group factors into broad categories.

2. Methodology

Each respondent was asked to indicate the degree to which he agreed with the statement in a five-point Likert scale. An example is as: "Effective and efficient SCM increase customer- satisfaction level and an influential factor to supply chain performance".The industry personnel have been asked to give their rating against this statement in the scale of 1 to 5 (1: Strongly Disagree, 2: Don't Agree, 3: Somewhat Agree, 4: Agree, 5: Strongly agree).A field survey was carried out using questionnaire 31 no. of respondents were requested to fill up the questionnaire by physical consultation with the researcher and the answers were set-up in a tabular form to make ready for the statistical software used for finding the critical factors (Minitab 16).

14 factors captured 82% of the total variance of the data set. Principal component analysis (PCA) summarises a 23 dimensional dataset into a smaller number, 14 of dimensions while preserving the variation in the data to the maximum extent possible. The objective of PCA is to capture those features in the data that help to better understand an issue of interest or to discover interesting new patterns among the relationships between supply chain performance measurement variables. Each principal component provides a set of factor loadings of the indicators, which corresponds to their importance for the component, i.e., the higher the loading of an indicator, the more useful for explaining variation in the direction of the principal component.

A principal component analysis was performed using varimax factor rotation to group the factors and thus determine the category of factors (constructs). Five constructs were formed. Table 1 gives the constructs and their constituent factors. It also gives various statistics (such as Eigen values, variance, factor loading) for each factor.

Table 1: Descriptive statistics of factor

Factors	Mean	Median	SD	Kurtosis	Skewness
Permanent suppliers	4.35	4	0.75	1.72	-1.20

Vendor relationship with e-procurement	4.61	5	0.62	.9777	-1.37
Customer Relationship Mgt	4	0.85	4	0.16	-0.68
Collaboration with all partners	3.90	1.27	4	0.66	-1.25
Web based application and services with ERP	4.06	1.06	4	1.13	-1.20
Supplier Relationship Mgt	3.83	1.12	4	-0.03	-0.85
Single mode of transportation	3.90	1.42	4	0.42	-2.30*
Inventory planning, analysis and optimisation	4.03	1.27	4	1.06	-1.39
Degree of decision making by different department	4.54	0.96	5	6.62	-2.55*
Outsourced transportation	4.38	1.20	5	3.13	-1.05
Product quality check at all level with manufacturing system	3.9	1.027	4	-0.897	-2.45*
B2B Exchange	3.5	0.840	3	-0.672	-1.75*
Customer Service	3.35	0.931	4	1.185	-1.06
Marketing and sales	3.80	0.677	4	1.040	-3.36*
Logistics and Transportation	4.15	0.783	4	1.008	-0.78
Effective and efficient SCM increase customer satisfaction	3.05	1.125	3.5	-1.034	-3.26*
Supply Chain Software and Technology	4.075	1.000	4	-0.710	-1.15
Supply Chain Event Mgt	3.1	0.959	3.5	0.148	-1.29
Vendor managed inventory V/s in-house inventory	4.25	0.781	4	0.616	-0.98
Different storage facilities along with central storage	3.85	0.954	4	-0.654	-2.18*
Importance of just-in-time for production	3.05	0.679	3	-0.718	-3.38*
ERP system	4.1	0.834	3	-0.463	-0.71
Warehouse management System	4.4	0.85	5	8.61	-2.51*

Table2 : Category of factors

Factors	**Eigen values**	**Variance (%)**	**Factor loading**	**Principal components**
Permanent suppliers	7.267	19.406	.827	SRM
Vendor relationship with e-procurement	6.682	17.844	.812	
Customer Relationship Mgt	3.444	9.197	.801	

Collaboration with all partners	3.151	8.414	.699	CRM
Supplier Relationship Mgt	2.432	6.494	.684	SRM
Supply chain event management	2.136	5.704	.774	SERVICE FOCUS
Customer Service	1.616	4.315	.731	
Outsourced transportation	1.521	4.061	.702	LOGISTICS
Logistics and Transportation	1.432	3.824	.655	
Inventory planning, analysis and optimisation	1.218	3.252	.629	
Vendor managed inventory V/s in- house inventory	1.187	3.169	.597	
ERP system	1.062	2.836	.590	IT ENABLED SERVICE
Web based applications and services	2.320	6.195	.653	
Supply Chain Software and Technology	1.354	3.615	.651	

3. Result and Discussion

The results of PCA are splendidly lucid and tremendously apparent from the organisational perspective of supply chain performance measurement. The outcomes of the research are enormously alluring and extremely appealing. The 14 dominating factors have been transpired into 5 important dimensions (principal components): (1) SRM (2) CRM. (3)Service Focus which needs special attention to make supply chain activities healthy (4) Logistics (5) IT enabled services.

In sponge iron industries, a multi-mode transportation is entertained. Selection of mode of transportation is purely dependent upon the privileged conditions. However, a logistic approach for suitable mode of transportation gives high benefits in terms of manpower and money and timely incoming/delivery of raw materials as well as products. IT enabled services should be more encouraged which could help for quality checking at all levels and making the decision efficiently. Supplier Relationship Management and Customer Relationship Management should be encouraged in the industries. A permanent supplier selection process as well as selecting the right customers will be quite beneficial to the sponge iron industries. This needs a collaborative effort among all the stakeholders. Service focus like Customer Service as external entity and Supply Chain Event Management as internal entity would help the sponge iron industries irrespective of the category to which the industries possess. Moreover, a software adaption like MINITAB-16 would help the process for time to time shift in paradigm.

References

1. Lee J. Krajewski and Larry P.Ritzmann: Operations Management – Process and Value Chain, 7th Edition, PHI, 2005
2. Mary Samner: Entreprise Resource Planning, Pearson Edn., 2000
3. Sunil Chopra and Peter Meindl: Supply Chain Management – Strategy, Planning & Operations, 2nd Edition. Pearson Edn., 2005
4. H.S. Moharana, J.S. Murty, S.K. Senapati: Information Technology and the Supply Chain, Presented at International Seminar for IT, HIT, West Bengal, December 2006.

5. H.S. Moharana, J.S. Murty, S.K. Senapati: Sponge Iron Industries And Their Responsibility For Combating Climate Change nd the Supply Chain, Presented at National Seminar on Environment at NIT, Rourkela, 2010.

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