Improving Financial Performance Of Supply Chain In A Spice Industry

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Abstract

The main aim of this paper is to analyze the supply chain process performance of a firm to its short term financial strategic objectives. Supply chain performance metrics measure the performance of supply chain process in terms of reliability, responsiveness, agility, cost and asset management based on Supply chain operational research (SCOR) model. To evaluate supply chains (SC) operations Fuzzy Analytic approach (FAHP) is combined with SCOR model. The financial performance metrics is analyzed and evaluated using terms of profitability and efficiency using Du Pont Ratio Analysis. To attain the relationship between (SC) process performances to the company's financial performance Dempster Shafer/Analytical Hierarchy Process (DS/AHP) is used. Supply Chain Flexibility Link Index (SCFLI) developed shows to what extend SC processes performances are connected to company's financial objectives.

Keywords: Supply Chain, SCOR model, DS/AHP, Fuzzy AHP, SCFLI

I. INTRODUCTION

Organizations should develop strategies and tactics to achieve increase in productivity, cost reduction and quality improvement otherwise the organizations will not be able compete or survive. But managers fail to interchange such strategies usually when they work against each other, which is the real challenge. For example implementing such strategies, sometimes negatively impact the quality or productivity. The management of material, products, information and time, flows through the supply chain has a direct impact on the success of these strategies. A supply chain is a set of a company's entire operations directly or indirectly linked and interacted to transform inputs into outputs that are delivered to the end customer. Many Organizations still trust reviewing financial aspects of their business to evaluate their business performance. But an atomistic view of important success factors is not possible by considering only financial measures.

Financial performance measures are governed by rules and guidelines which make them a simple and clear source of useful information about financial outcomes and the internal operations shown in the financial statements. Although financial performance measures have been widely used to measure an organization's performance, their ability to capture and reflect the different aspects related to an organization's performance is limited. Financial performance measures are used to evaluate how well the organization converts inputs into desired outputs without tracing the way in which the various inputs interact to produce the outputs. Since supply chain activities begin with a customer order and end when a satisfied customer has paid for his purchase, supply chain management has become a strategic tool to achieve the satisfaction of customer demand. Managers at different levels should be aware of the connection between supply chain performance and the company's financial strategy, and how the company's daily actions can impact the overall financial performance.

To achieve maximum profit is the primary long term financial goal of a company. To achieve this long term financial goal, initially the company should convert it into short term performance objectives that can be measured and monitored. These objectives can be achieved through identifying the source of poor performance in terms of specific activities and formulating short-term strategies for improving the performance of these activities. The main of this paper is to develop SCFLI to test the extent to which SC operations is connected to firm's financial performance. Analyzing the index helps to cover daily SC operations and shows the areas that need improvement. The preliminary analysis reveals that the company has low Return on Asset (ROA), and Total Asset Turnover (TAT) resulting lower than the average profitability. Industry Average is the average of all stock data values in the same industry. Industry Average is used to compare a stock's Valuation, Growth, and Profitability ratios to that of other stocks in the same industry. The financial performance is decreasing which highlights that the firm has a problem in generating sales from assets employed in business.

The literature review discussed in the next section, section 3 discusses the methodology & section 4 shows the data analysis and interpretation.

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II. LITERATURE REVIEW

The Dempster Shafer/Analytical Hierarchy Processes (DS/AHP) model is employed to link SC processes performance to the company's financial performance through determining the relative importance weights of SC performance measures with respect to the priorities of financial performance Supply Chain Financial Link Index (SCFLI) is used to test the extent to which SC processes' performance is linked to the company's financial strategic objectives. This index offers an effective supply chain management (SCM) tool to provide continuous feedback on SC performance and identify the appropriate corrective actions. Linking SC processes' performance to the company's financial strategic objectives enables companies to gain competitive advantages and formulate strategies for improved SCM through linking such strategist o the focus area of enhancing the financial performance (Elgazzar, S 2012).

Supply chain management is able to provide a competitive advantage & profitability in a distinctive and substantial manner. To attain success supply chain helps in mainly four ways in the area of competitiveness, they are cost, quality, response time and flexibility. The supply chain performance metrics used were based on the supply chain operational reference model (SCOR), which the financial metrics used where based on the economic value added concept. Success of creating link mainly satisfies two important stake holders, the customers and the stakeholders. Using this SCOR model of supply chain council suggest that supply chain integration & the specific related customers have a direct impact on overall financial performance of the firm. The problem is that the top executives fail to understand the connection between the supply chain performances and the financial metrics at the early stages on their minds. EVA can be generally categorized into revenue cost and assets. Mangers attain more knowledge on the impact of innovation technology improvements and cost reductions by understanding the EVA components. Cost reduction, revenue, growth and asset are directly related to the supply chain management. Therefore encouraging EVA is directly proportional to effective and efficient management of supply chain. (Presutti Jr. and Mawhinney-2007).

A supply chain is a network of facilities that procure raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system.. The SCOR model is the first model that can be used to configure the supply chain based on business strategy. This process reference model enables all departments and businesses involved in developing and managing the integrated supply chain to collaborate effectively. The SCOR model integrates the well-known concepts of business process reengineering, benchmarking, and process measurement into a cross-functional framework. The SCOR model is originally founded on five distinct management processes, namely, Plan, Source, Make, Deliver and Return which are called Level 1 processes. The processes are further decomposed into process categories depending on the type of environment in which the SCOR model is applied. Using the levels of the SCOR model, a business can quickly and unambiguously describe its supply chain. SCOR tend to fall into five defining categories: supply chain reliability, supply chain responsiveness, supply chain flexibility, supply chain costs, and efficiency in managing assets..SCOR implementation helps to achieve Cost reduction and customer service improvement, results in improvement in return on assets (HuangS.H-2005)

AHP (Analytical Hierarchal Process) is used to solve complex problems involving multiple criteria. It is considered as a systematic procedure for representing the elements of any problem hierarchically, breaking the problem into smaller and smaller constituent parts and finally guiding the decision maker through a series of pair wise comparison judgments. Traditional AHP includes no: of comparisons this is because of the need to compare each decision alternative. Considering a group Decision Alternatives (D.A's) reduces the no: of comparisons. The Dempster Shafer theory (DST) is the generalization of classical probability theory & a modified version of AHP is used here. The DST approach differs from more conventional methods in that there is no requirement that belief not committed to a given proposition should be committed to its negation. This offers a certain additional realism. The second basic idea of DST is that numerical measures of uncertainty may be assigned to overlapping sets and subsets of hypotheses, events or propositions as well as to individual hypothesis. The method provides opinions on sets of decision alternatives and addresses certain concerns related with the standard AHP: The number of comparisons and opinions are at the decision maker's discretion, there is no need for consistency checks at the decision alternative level & gives allowance for ignorance/uncertainty in our judgments. (Beynon M- 2000).

The fuzzy analytic hierarchy process approach (Fuzzy AHP) and the supply chain operations reference-model (SCOR) is incorporated to evaluate and improve the performance of SC operations. Applying the SCOR FAHP method allows organizations to improve the effectiveness and efficiency of supply chain operations in meeting supply chain goals through identifying processes that are working well and areas where the supply chain might need improvement. The method identifies the main processes and sub processes in the supply chain, determines the relative importance weight of each attribute, assigns a performance rate, calculates the weighted rate for each attribute and finally aggregates the weighted rate for each attribute across all SC performance measurement attributes to determine the performance index of the company's supply chain. (Elgazzar.S - 2010).

III.METHODOLOGY

The research methods, models and techniques used in this research the SCOR model, DS/AHP model & the FAHP technique. This paper analyses supply chain operational strategy and the company's overall strategy through linking supply chain operations' performance to the company's financial performance in the manufacturing sector.

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Fig 1- Linking By Ds/Ahp Model Where Θ is the frame of discernment which represents all decision alternatives (D.A.'s) (i.e., reliability (RL), responsiveness (RS), agility (AG), cost (CO), and asset management (AM)

A technique incorporating FAHP technique and SCOR model is developed to analyze, assess and improve the performance of SC operations. This technique allows organizations to assess and improve the effectiveness and the efficiency of SC operations in meeting SC goals and to contribute to overall improvement in the company's performance through identifying SC processes that are working well and areas where the SC might need improvement. In addition, a relation or path is obtained between SC operations' performance to the company's short-term strategic financial objectives using the DS/AHP mode as shown in fig: 1. This path allows the determination of the impact of SC operations' performance on enhancing a company's overall financial performance through connecting the performance of such operations' to the company's financial goals. It enables companies to formulate SC operational strategies for optimizing short-term strategic financial objectives through connecting such strategies to the focus area of enhancing the financial performance.

SC operations' performance is measured in terms of agility, cost, reliability, responsiveness, and asset management based on the SCOR FAHP technique. The Financial performance evaluated shows the company's profitability and operating efficiency based on Du Pont ratio analysis through ROA (cost, revenue, and assets). Using the results of Du Pont ratio analysis, the priorities of financial performance factors (profitability and efficiency) is determined according to the assessment of their corresponding components. Then, SC performance metrics are linked to financial performance metrics using the DS/AHP mode. This model helps to find the importance weights of the five main SC performance measures with respect to financial performance priorities.

Table 1: Linking Supply Chain & Financial Performance Factors

	SC performance attributes					Financial performance metrics	
	Customer- Facing			Internal - Facing			
SCOR level 1- stratgic SC metrics	Reliability	Responsiveness	Flexibility	Cost	Assets	EVA components	Du Pont analysis
Perfect Order Fulfilment	■					Revenue	Profitability & Efficiency factor
Order Fulfilment Cycle Time		■					
Upside Supply Chain Flexibility			■			Cost	Profitability factor
Upside Supply Chain Adaptability			■				
Downside Supply Chain Adaptability			■				
Supply Chain Management Cost				■			
Cost of Goods Sold							
Cash-to-Cash Cycle Time					■	Assets	Efficiency factor
Return on Supply Chain Fixed Assets					■		
Return on Working Capital					■		

The questionnaire prepared was given to the four experts which includes Human Resource Manager, Production Planning & Control manager, Export Manager & Project Manager. They were asked to give response for all the questions on a 5 point ratio scale.

The questionnaire is designed based on a scale with the values 1, 3, 5, 7 and 9, where 1 denotes equally important, 3 for slightly more important, 5 for strongly more important, 7 for demonstrably more important and 9 for absolutely more important.

Table 2: Performance Attributes And Associated Level 1 Metric

Performance Attribute	Performance attribute definition	Level 1 Metric
Supply Chain Reliability	The performance of the supply chain in delivering the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.	*Perfect order fulfillment*
Supply Chain Responsiveness	The speed at which a supply chain provides products to the customer.	*Order fulfillment cycle time*
Supply Chain Flexibility	The agility of a supply chain in responding to market place changes to gain or maintain competitive advantage.	*Upside supply chain flexibility.* *Upside supply chain adaptability.* *Downside supply chain adaptability*
Supply Chain Costs	The costs associated with operating the supply chain.	*Supply chain management cost* *Cost of goods sold*
Supply Chain Asset Management	The effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets.	*Cash to cash cycle time* *Return on supply chain fixed assets.* *Return on working capital*

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IV. DATA ANALYSIS AND INTERPRETATION

A. Finding the priorities of financial performance factors:

Based on the result of Du Pont ratio analysis, the focus area for enhancing the financial performance can be determined by repositioning the priorities of financial performance factors (profitability and efficiency). To reposition the priorities of these factors, a pair-wise comparison is conducted using a pair-wise questionnaire. The four experts respond to the questionnaire and responses are as presented in table 3.

Table 3: Experts Responses On Profitability & Efficiency

	EXP. 1	EXP. 2	EXP. 3	EXP. 4
P vs. E	0.2	0.33	0.33	0.2

GEOMETRIC MEAN(G.M)

$$(a1 * a2 * a3 * \ldots\ldots an)^{\left(\frac{1}{n}\right)} = (0.2*0.33*0.33*0.2)^{0.25} = 0.258$$

The geometric mean (G.MEAN) is used to aggregate the experts' responses in order to establish the pair wise comparison matrix following the traditional AHP method.

Table 4: Experts Responses Weight Calculation

	P	E	Row sum
P	7.896	2.062	10.048
E	30.929	7.896	38.915
Total row sum			48.963

The priorities of the financial performance factors are determined as follows:
Profitability (P) =10.48\48.963=20.52, Efficiency (E) =38.915\48.963=79.47

For this pair-wise comparison matrix, the Eigenvector method is used for weight calculation as shown in table 4. The priorities of the financial performance factors are determined as follows: Profitability (P) 20.52% and Efficiency (E) 79.47%.

B. Finding the relative importance weights of the five main SC performance measures:

Since the priorities of the financial performance factors are determined, the company now is in the position to link SC operational strategy to the focus area of enhancing the financial performance. To create this link, DS/AHP approach is conducted to determine the relative importance weights of the main SC performance measures (RL, RS, AG, CO, AM) with respect to the priorities of financial performance factors. DS/AHP model is based on a measure of favorability of knowledge that decision makers have about a group of D.A.'s compared with the frame of discernment (θ) within the context of each specific criterion. For each criterion there are certain groups of D.A.'s, including θ, about which the decision maker can express some degree of favorable knowledge. The group of decision makers is asked to rank the five main SC performance measures priority - with respect to each financial performance criterion - using the following 4 unit scale as a basis for discriminating levels of preference: 3 for slightly more important, 5 for strongly more important, 7 for demonstrably more important and 9 for absolutely more important.

The initial knowledge matrices represented in table: 6 shows the consolidated opinions of the decision makers for ranking the five main SC performance measures priority with regard to each financial performance criterion. In the knowledge matrix values in the final column are the measures of favorability of certain groups of D.A. in each row with respect to θ. For example in knowledge matrix, CO is viewed as demonstrably more important compared to θ. The zeros which appear in the knowledge matrix indicate no attempt to assert preference between SC performance measures, (e.g. RL to CO); this assertion can be made indirectly through knowledge of the favorability of RL to θ and CO to θ relatively. The indirect knowledge is that CO is considered more important to RL in relation to θ.

Table 5: Experts Responses On Profitability Factors

	EXP. 1	EXP. 2	EXP. 3	EXP. 4	G. MEAN
RL vs.θ	3	5	3	3	3.4
RS vs.θ	5	3	5	3	3.87
AG vs θ	3	5	5	5	4.4
CO vs θ	5	7	7	3	5.2

Table 6:

INTIAL KNOWLEDGE MATRIX FOR PROFITABILITY (P)					
	RL	RS	AG	CO	θ
RL	1	0	0	0	3.4
RS	0	1	0	0	3.87
AG	0	0	1	0	4.4
CO	0	0	0	1	5.2
θ	0.294	0.258	0.227	0.192	1

Then, according to DS/AHP method the priority values of financial performance factors are incorporated into each of the initial decision knowledge matrices. Multiplying the elements in the last column (except the last entry in that column) by the respective importance value for that criterion (noting that the importance values do not affect the elements in the matrix which are either zero or one) we get the knowledge matrix.

Table 7:

KNOWLEDGE MATRIX FOR PROFITABILITY (P)					
	RL	RS	AG	CO	θ
RL	1	0	0	0	0.698
RS	0	1	0	0	0.794
AG	0	0	1	0	0.903
CO	0	0	0	1	1.067
θ	1.433	1.259	1.107	0.937	1.000

Table 8: Normalized Weights Of Profitability & Efficiency Factors

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Profitability (P)	%	Efficiency (E)	%
RL	0.1288	RL	0.2209
RS	0.1461	RS	0.2511
AG	0.1658	AM	0.4152
CO	0.1954	θ	0.1128
θ	0.3639		

Then, these normalized pieces of evidence can be combined using Dempster's rule of combination. The D–S combination rule determines the joint $m_{1\text{-}2}$ from the aggregation of two basic probability assignments (BPA) m_1 and m_2 by following equation:

$$m_{1\_2}(A) = \frac{\sum_{B\cap C=A} m_1(B)m_2(C)}{1-K} \quad \text{when } A \neq \Phi \text{ and } m_{1\_2}(\Phi) = 0 \quad K = \sum_{B\cap C=\Phi} m_1(B)m_2(C)$$

The denominator (1-K) is a normalization factor, which helps aggregation by completely ignoring the conflicting evidence where K is the degree of conflict in two sources of evidences.

By applying D–S rule of combination on sources of information P and E, the following data is generated.

Table 9: D-S Rule Calculation-1

$m_2(E)$	$m_1(P)$					
	$m_2(E)_{RL}$ = 0.129	$m_2(E)_{RS}$ = 0.146	$m_2(E)_{AG}$ = 0.166	$m_2(E)_{CO}$ = 0.196	$m_2(E)_{-}$ = 0	$m_2(E)_{\theta}$ = 0.364
$m_2(E)_{RL}$ = 0.221	**0.029{RL}**	0.032{Φ}	0.019{Φ}	0.037{Φ}	0{Φ}	**0.080{RL}**
$m_2(E)_{RS}$ = 0.251	0.032{Φ}	**0.037 {RS}**	0.042{Φ}	0.049{Φ}	0{Φ}	**0.091{RS}**
$m_2(E)_{AG}$ = 0	0{Φ}	0{Φ}	**0{AG}**	0{Φ}	0{Φ}	**0{AG}**
$m_2(E)_{CO}$ = 0	0{Φ}	0{Φ}	0{Φ}	**0{CO}**	0{Φ}	**0{CO}**
$m_2(E)_{AM}$ = 0.415	0.054{Φ}	0.061 {Φ}	0.069{Φ}	0.081 {Φ}	**0 {AM}**	**0.151{AM}**
$m_2(E)_{\theta}$ = 0.113	**0.015{RL}**	**0.016 {RS}**	**0.019{AG}**	**0.022{CO}**	**0{AM}**	**0.041{θ}**

Degree of Conflict (K) =sum of all values of {Φ}=0.499, Normalized factor (1 – K) =0.501

Table 10: D-S Rule Calculation-2

m1 – 2(A)RL = [SUMm1(P)m2(E) of RL]/(1-k)	0.124/0.501	0.2475
m1 – 2(A)RS = [SUMm1(P)m2(E) of RS]/(1-k)	0.144/0.501	0.287
m1 – 2(A)AG = [SUMm1(P)m2(E) of AG]/(1-k)	0.019/0.501	0.037
m1 – 2(A)CO = [SUMm1(P)m2(E) of CO]/(1-k)	0.022/0.501	0.043
m1 – 2(A)AM = [SUMm1(P)m2(E) of AM]/(1-k)	0.151/0.501	0.301
m1 – 2(A)θ = [SUMm1(P)m2(E) of θ]/(1-k)	0.041/0.501	0.081

Table 11: The Relative Importance Weights Of The Company's S C Performance

	SUM m1(P) m2(E)	S.C Performance weight	%
RL	0.124	0.2475	24.75%
RS	0.144	0.287	28.70%
AG	0.019	0.037	3.70%
CO	0.022	0.043	4.30%
AM	0.151	0.301	30.10%
θ	0.041	0.081	8.10%

And then, the overall BPA for SC performance measures ($m_{sc\ performance\ measures}$) can be constructed and consequently the relative importance weights of the five main SC performance measurement attributes are ranked as illustrated.

C. Finding the relative importance weights of the SC performance measurement attributes.

A group of four experts was assembled comprising the Production Planning and Control manager, the Project manager, the Export manager, and Human Resource manager. Structured interviews were conducted with the experts group. A pair-wise questionnaire form was used to perform comparison and the relative importance of two elements was rated using a scale. To aggregate the experts' responses, fuzzy pair-wise comparison matrix based on triangular fuzzy numbers (L, M, U) was used in expressing the consolidated opinions of the experts. For the questionnaire responses, α = 0.5 was used to express that environmental uncertainty is steady in addition λ=0.5 as used to express that a future attitude is fair. To establish the aggregate pair-wise comparison matrix, the defuzzication of the triangular fuzzy numbers derived from the fuzzy pair-wise comparison matrix was done. And consequently the aggregate pair-wise comparison matrix was established. Then, the Eigenvector method was used for weight calculation. Eigen value and Eigenvector were calculated for each aggregate pair-wise comparison matrix at each level. Then Consistency index (C.I.) and consistency ratio (C.R.) were calculated for each aggregate pair wise comparison matrix at each level to verify the consistency of the comparison matrix. Finally, the relative importance weights of the performance measurement attributes were then determined by aggregating the weights throughout the hierarchy.

Table 12: Experts responses on SC performance measures

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SC Performance Measures	Expert's Responses				Fuzzy Pair-wise Comparison Matrix			Uncertainity Level		Aggregate Pair-wise Comparion Matrix		
Supply Chain Cost	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Min (L)	Geomean (M)	Max (U)	α	β			Aggregation
CO												
CO1-1 VS CO1-2	0.33	3	1	0.33	0.33	0.756026961	3	0.5	0.5	0.543013481	1.878013481	1.210513481
CO1-1												
CO2-1 VS CO2-2	5	5	5	7	5	5.43878653	7	0.5	0.5	5.219393265	6.219393265	5.719393265
CO2-1 VS CO2-3	3	7	5	5	3	4.786739859	7	0.5	0.5	3.893369929	5.893369929	4.893369929
CO2-1 VS CO2-4	3	3	5	5	3	3.872983346	5	0.5	0.5	3.436491673	4.436491673	3.936491673
CO2-2 VS CO2-3	5	0.33	0.33	0.2	0.2	0.574456265	5	0.5	0.5	0.387228132	2.787228132	1.587228132
CO2-2 VS CO2-4	5	0.2	3	0.33	0.2	0.99749057	5	0.5	0.5	0.598745285	2.998745285	1.798745285
CO2-3 VS CO2-4	0.2	0.33	3	5	0.2	0.99749057	5	0.5	0.5	0.598745285	2.998745285	1.798745285
CO1-2												
CO2-5 VS CO2-6	5	3	7	1	1	3.201085873	7	0.5	0.5	2.100542936	5.100542936	3.600542936
CO2-5 VS CO2-7	3	5	5	5	3	4.400558684	5	0.5	0.5	3.700279342	4.700279342	4.200279342
CO2-6 VS CO2-7	0.2	3	5	5	0.2	1.967989671	5	0.5	0.5	1.083994836	3.483994836	2.283994836

Table 13: Eigen Vector Weight Calculation

CO	CO 1-1	CO 1-2			Weight
CO 1-1	1	1.2105			0.547614
CO 1-2	0.826105	1			0.452386
CO 1-1	CO 2-1	CO 2-2	CO 2-3	CO 2-4	Weight
CO 2-1	1	5.71	4.893	3.936	0.61315
CO 2-2	0.175131	1	1.587	1.798	0.157153
CO 2-3	0.204374	0.63012	1	1.798	0.129198
CO 2-4	0.254065	0.556174	0.556174	1	0.100499
CO 1-2	CO 2-5	CO 2-6	CO 2-7		Weight
CO 2-5	1	3.6005	4.2002		0.650236
CO 2-6	0.277739	1	2.283		0.225952
CO 2-7	0.238084	0.43802	1		0.123812

Table 14: Eigen Vector Weight Of Each Attribute.

SUPPLY CHAIN COST	ATTRIBUTE CODE	Eigen vector (Weight)
Supply Chain Management Cost	CO1-1	54.76%
Cost of Goods Sold	CO1-2	45.24%
Freight expense	CO2-1	61.31%
Direct marketing expense	CO2-2	15.72%
Direct sales expense	CO2-3	12.92%
Administrative expense	CO2-4	10.05%
M Cost	CO2-5	65.02%
L Cost	CO2-6	22.60%
Indirect Costs Related To Making Product	CO2-7	12.38%

D. Finding the weighted rates of the supply chain performance measurement attributes

A performance rating scale was established based on the historical performance of the company. A performance rate was then assigned for the supply chain performance measurement attributes with respect to the established performance rating scale. After determining the performance rate and the relative weight of each attribute, the weighted rate was calculated for each SC performance measurement attribute by multiplying the importance weight of each attribute by its performance rate as shown in table below.

Table 15: Performance Based Weighted Rate.

Attribute		MIN	MAX	Annual Performance	Rate	Rate Value	Weight	Weighted Rate	Total sum
SUPPLY CHAIN COST									
Supply Chain Management Cost	CO1-1	0.2	1		G	0.6	0.5072	0.30432	
Freight expense (%)	CO2-1	0.06	0.02	0.03	VG	0.6	0.61	0.366	
Direct marketing expense (%)	CO2-2	0.05	0.02	0.05	VP	0.02	0.16	0.0032	
Direct sales expense (%)	CO2-3	0.04	0.01	0.025	VG	0.6	0.13	0.078	
Administrative expense (%)	CO2-4	0.1	1	0.08	VG	0.6	0.1	0.06	
Cost of Goods Sold	CO1-2	0.2	1		P	0.4	0.4	0.16	0.464
M Cost	CO2-5	0.68	0.55	0.62	P	0.4	0.65	0.26	
L Cost	CO2-6	0.11	0.06	0.06	P	0.4	0.23	0.092	
Indirect Costs Related To Making Product	CO2-7	0.08	0.03	0.05	P	0.4	0.12	0.048	

E. Evaluating the performance of supply chain operations:

To evaluate the efficiency and the effectiveness of current SC strategy, the SCFLI is calculated for the company. Based on the proposed SCOR FAHP technique, SC operations' performance is evaluated by assigning performance rate (0.2, 0.4, 0.6, 0.8, or 1) for each of the SC performance measurement attributes throughout the hierarchy of SC, from the process element levels till the configuration level, to assess the performance of the company's SC operations with respect to the established performance rating scale. Then, the performance rates of all measurement attributes are adjusted by their relative importance weights. The weighted rates of all measurement attributes from the lowest implementation level till the configuration level are aggregated-

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using averaging aggregation method- throughout the hierarchy of the SC to determine the performance rate of the five main SC performance measures at the top level (RL, RS, AG, CO, AM). Where 0.2 denotes very poor performance, 0.4 denotes poor performance, 0.6 denotes good performance, 0.8 denotes very good performance and 1 denotes excellent performance with respect to the performance rating scale. To calculate SCFLI, the performance rates which are assigned for the five main SC performance measures based on the SCOR FAHP technique are adjusted by the relative importance weights of these measures as shown in table: 16. By multiplying the relative importance weight of each measure (W) by its performance rate (R), the weighted rate (WR) of each performance measure is determined.

Table 16: Priority Rating Of Attributes

THE RELATIVE IMPORTANT WEIGHTS OF MAIN SUPPLY CHAIN PERFORMANCE MEASURES WITH RESPECT TO THE FINANCIAL PERFORMACE FACTORS				
Measure	**PERFORMANCE RATE-R**	**WEIGHT-W**	**W *R**	**PRIORITY RATING**
RL	0.78	0.248	19.34%	5
RS	0.67	0.287	19.23%	4
AG	0.69	0.037	2.55%	2
CO	0.46	0.043	1.98%	**1**
AM	0.52	0.301	15.65%	3
SUM	3.12	0.916	0.5876	

SCFLI=ΣWR/ΣW	**0.64**

V. CONCLUSION AND FUTURE WORK

The company's SCFLI is calculated to be 0.64 which reflect the extent to which current SC processes' performance are linked to the company's financial priorities. The relative importance weight of each SC performance measure is determined, which indicates the SC processes that need improvement. Here more focus must be made of managing cost. To accomplish the aim of managing SC costs, the firm focuses SC strategy on managing SC costs. Also the company need to determine the objectives and the action plans needed to implement the strategy. So that the Firm could achieve more profit and more linkage with the supply chain and could improve the flexibility link index.

SCFLI was developed to test the extent to which SC processes' performance is linked to the company's short-term financial strategic objectives. The findings revealed that SC operational strategy and the company's overall financial strategy can be aligned through understanding the link between SC performance metrics and financial performance metrics.In future an appropriate SC operational strategy can also be formulated on the areas in the SC that needs improvement. Also the analysis can be done on more than one firm at a time which leads to comparison of SC and linkage index between various organizations.

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