

# Intelligent Decision Support System Towards Measuring Performance Of Firm

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**Abstract:** In present era, it is realized in order to respond the production activities of individual firm in accordance with customer demand. It became necessitate to keep the various modern supply chains well. G-F-A-L-R (Green-Flexibility-Agility-Leanness-Resilient) SC strategies of SC worked influential to answer production of firms. In the presented research work, a multi criterion decision making performance appraisal module (consist of green flexibility-agility-leanness-resilient activities corresponding to their interrelated metrics) coupled with Fuzzy Performance Index mathematical model has been proposed to assess the overall performance of individual firm.

**Keywords:** Multi-Criterion Decision Making (MCDM), Benchmarking, G-F-A-L-R (Green Flexibility-Agility-Leanness-Resilient) SC, Performance Measurement (PM), Fuzzy Performance Index (FPI)

## I. INTRODUCTION and LITEATURE SURVEY

SC is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities, which produce value in the forms of products and services in the hands of the ultimate customer Sc is considered as a network that performs the procurement of raw material, transformation of materials into intermediate and end-products, distribution and selling of the end-products to end customers. Fig: 1 shown the SCM strategies.

SC is an integrated process, which involves the processing of raw materials into finished goods and making them available to the end user (Sahu et al., 2015a,b; Sahu et al., 2016a,b,c,d; Sahu et al., 2016a,b,c,d,e,f; Sahu et al., 2017a,b,c,d,e,f,g).

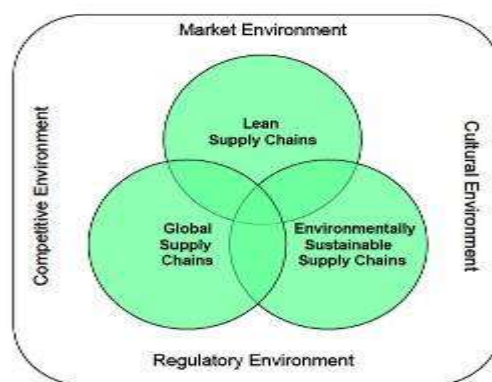


Fig: 1. SCM strategies

SCM is the upstream fraction of the value chain activities aiming to ensure that the right materials, services and technology are purchased from the right sources, at right time, at right quantity.

SC is a continuous process, from raw materials to finished goods, via each traditional distinct function such as forecasting, purchasing, manufacturing, distribution, and sales and marketing (Sahu et al., 2012; Sahu et al., 2014)

The relevant literature survey has been conducted to electing the pertinent G-F-A-L-R supply chain dimension for constructing module.

(Sahu et al., 2012; Sahu et al., 2014; Sahu et al., 2015a,b; Sahu et al., 2016a,b,c,d; Sahu et al., 2016a,b,c,d,e,f; Sahu et al., 2017a,b,c,d,e,f,g).

## II.CASE STUDY

### Procedural Hierarchy: Case Application

Using the concept of Trapezoidal Fuzzy Numbers (TFNs) in fuzzy set theory, the linguistic variables have been approximated by appropriate Trapezoidal Fuzzy Numbers operators (Sahu et al., 2016a,b,c,d,e,f). The aggregated fuzzy appropriateness rating against individual 2<sup>nd</sup> level indices along with corresponding aggregated fuzzy weight has been computed. Table: 2-4 have depicted the linguistic information given by DM supported by linguistic scale Sahu et al., 2016a,b,c,d,e,f.

Considering a 2-level evaluation performance appraisal; the following entry to be used for computational purpose.

$$C_i = i^{th} \text{ 1}^{st} \text{ level evaluation index; } i = 1,2,\dots, m.$$

$C_{ij} = j^{th}$  2<sup>nd</sup> level evaluation index which is under  $i^{th}$  1<sup>st</sup> level evaluation index  $C_i$ ;  $j = 1, 2, \dots, n$ .

The computed fuzzy performance rating of individual 1<sup>st</sup> level evaluation indices can be calculated as (Eq. 1).

$$U_i = \frac{\sum_{j=1}^n (w_{ij} \otimes U_{ij})}{\sum_{j=1}^n w_{ij}} \quad (1)$$

Here  $U_{ij}$  represents aggregated fuzzy performance measure (rating) and  $w_{ij}$  represent aggregated fuzzy weights corresponding to criteria  $C_{ij}$  at 2<sup>nd</sup> level. Also,  $U_i$  represents the computed fuzzy performance measure (rating) corresponding to the index  $C_i$  at 1<sup>st</sup> level.

Thus, overall fuzzy performance index  $U(FPI)$  can be obtained as follows.

$$U(FPI) = \frac{\sum_{i=1}^m (w_i \otimes U_i)}{\sum_{i=1}^m w_i} \quad (2)$$

Here  $U_i =$  rating of  $i^{th}$  1<sup>st</sup> level evaluation index  $C_i$ ;  $w_i =$  Importance grade of  $i^{th}$  1<sup>st</sup> level evaluation index  $C_i$ .

The FPI thus becomes  $[(0.230, 0.446, 1.590, 3.045; 1)]$  for the said candidate company under consideration G-F-A-L-R supply chain.

### III. CONCLUSION:

Presented Decision support systems (DSSs) might assist the managers of manufacturing firms towards measuring the performances of a firm under G-F-A-L-R supply chain dimensions in extent of subjective information. The outcomes of research work might help each manufacturing firm, which look for opportunity to benchmark others firms under similar supply chain dimensions. The ranking order has shown by bar chart.

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Table: 1 G-F-A-L-R SC appraisalment module (Sahu et al., 2012; Sahu et al., 2014; Sahu et al., 2015a,b; Sahu et al., 2016a,b,c,d; Sahu et al., 2016a,b,c,d,e,f; Sahu et al., 2017a,b,c,d,e,f,g)

Goal	1 <sup>st</sup> level driver	2 <sup>nd</sup> level indices
Fuzzy-Performance measurement of A firm under G-F-A-L-R supply chain, (C)	Greenness, C <sub>1</sub>	Green service, (C <sub>1,1</sub> )
		Green advertisement, (C <sub>1,2</sub> )
		Green delivery, (C <sub>1,3</sub> )
		Emotional purchase, (C <sub>1,4</sub> )
		Competitive advantage in adopting green strategies, (C <sub>1,5</sub> )
		Cost of environmentally friendly goods, (C <sub>1,6</sub> )
	Flexibility, C <sub>2</sub>	Flexibility in volume of product, (C <sub>2,1</sub> )
		Sourcing Responsiveness, (C <sub>2,2</sub> )
		Adaptability of delivery time by suppliers, (C <sub>2,3</sub> )
		Suppliers delivery time, (C <sub>2,4</sub> )
	Agile, C <sub>3</sub>	Responsiveness against supplier, (C <sub>3,1</sub> )
		Complain, (C <sub>3,2</sub> )
		Expedite managerial involvement, (C <sub>3,3</sub> )
		Customer care, (C <sub>3,4</sub> )
	Lean ,C <sub>4</sub>	Waste reduction, (C <sub>4,1</sub> )
		Responsiveness, (C <sub>4,2</sub> )
		Customer response adaptation, (C <sub>4,3</sub> )
		Development of policy to reduce waste, (C <sub>4,4</sub> )
	Resilient, C <sub>5</sub>	Increased preparedness to disturbances, (C <sub>5,1</sub> )
		Supplier development, (C <sub>5,2</sub> )
Team experience, (C <sub>5,3</sub> )		
Financial position, (C <sub>5,4</sub> )		

Table 2: Weights of 2<sup>nd</sup> level indices assigned by DMs

2 <sup>nd</sup> level indices	Weights of 2 <sup>nd</sup> level indices assigned by DMs		
	DM1	DM2	DM3
C <sub>11</sub>	H	H	VH
C <sub>12</sub>	MH	H	H
C <sub>13</sub>	H	MH	MH
C <sub>14</sub>	MH	MH	MH
C <sub>15</sub>	MH	MH	MH
C <sub>16</sub>	MH	MH	MH
C <sub>21</sub>	VH	VH	DH
C <sub>22</sub>	H	VH	DH
C <sub>23</sub>	VH	H	VH
C <sub>24</sub>	DH	H	H
C <sub>31</sub>	MH	H	MH
C <sub>32</sub>	H	MH	H
C <sub>33</sub>	MH	M	MH
C <sub>34</sub>	MH	M	H
C <sub>41</sub>	H	MH	ML
C <sub>42</sub>	MH	M	M
C <sub>43</sub>	M	MH	ML
C <sub>44</sub>	MH	MH	L
C <sub>51</sub>	L	ML	L
C <sub>52</sub>	VL	ML	ML
C <sub>53</sub>	ML	L	ML

$C_{34}$	DL	L	L
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Table 3: Weights of 1<sup>st</sup> level drivers assigned by DMs

1 <sup>st</sup> level indices	Weights of 1 <sup>st</sup> level indices assigned by DMs		
	DM1	DM2	DM3
$C_1$	VH	DH	H
$C_2$	H	H	H
$C_3$	DH	VH	DH
$C_4$	MH	H	MH
$C_5$	MH	M	MH

Table 4: Rating of 2<sup>nd</sup> level indices assigned by DMs

2 <sup>nd</sup> level indices	Rating of 2 <sup>nd</sup> level indices assigned by DMs		
	DM1	DM2	DM3
$C_{11}$	VH	H	MH
$C_{12}$	H	M	MH
$C_{13}$	M	H	VH
$C_{14}$	VH	VH	VH
$C_{15}$	VH	VH	VH
$C_{16}$	VH	VH	VH
$C_{21}$	H	VH	VH
$C_{22}$	VH	VH	H
$C_{23}$	H	M	NH
$C_{24}$	H	M	MH
$C_{31}$	VH	H	DH
$C_{32}$	VH	H	DH
$C_{33}$	H	VH	VH
$C_{34}$	DH	VH	VH
$C_{41}$	VH	VH	H
$C_{42}$	H	H	DH
$C_{43}$	VH	M	H
$C_{44}$	DH	M	VH
$C_{51}$	H	MH	H
$C_{52}$	VH	MH	H
$C_{53}$	MH	H	VH
$C_{54}$	MH	H	DH