Intelligent Decision Support System Towards Managing Production Of Firm

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Abstract: In last decade, each firm has begun to establish the production with rapid rate due to rich demand of goods with best quality. Many firm perceived the necessity to balance the production chain of organization. In the presented research work, a centroid approach merged with fuzzy set is applied on constructed G-F-A-L-R supply chain module for identifying a sick and strong chief driver of a firm; so that managers could hike their firm's performance up to standard level in case of non wanted performance. An empirical case research of assumed gear and shaft manufacturing firm is presented; proposed DSS is active for tracing the G-F-A-L-R supply chain's sick and strong chief drivers.

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 LIREATURE SURVEY:

SC is a continuous process, by which raw materials is transformed into finished goods, via each traditional distinct function such as forecasting, purchasing, manufacturing, distribution, and sales and marketing (Sahu et al., 2017a,b,c).

SC comprises a universal network of suppliers, factories, warehouses, distribution centre's and retailers through which raw resources are acquired, transformed and delivered to the end users.

SC is called as a value-adding relationship among partially discrete, yet interdependent entities that cooperatively procure and transform raw materials into finished products through sequential network structures. (Sahu et al., 2012; Sahu et al., 2014).

Decision-making is extremely intuitive while considering single criterion problems, since we only need to choose the alternative with the highest preference rating. However, when decision-makers (DMs) evaluate alternatives with multiple criteria, many problems, such as criterion weight, preference dependence, and conflicts among criteria, seem to complicate the problems and need to be overcome by more sophisticated tools and techniques. In order to deal with Multi-Criteria Decision Making (MCDM) problems, the first step is to figure out criteria/attribute listing. Next, we need to collect appropriate data or information in which the preferences of DMs can be correctly reflected upon and considered (i.e., constructing the preferences). Further work builds a set of possible alternatives or strategies in order to guarantee that the goal will be reached (i.e., evaluating the alternatives). 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. GROUP DECISION MAKING

It is a type of participatory process in which multiple individuals acting collectively analyze problems or situations, consider and evaluate alternative courses of action, and select from among the alternatives a solution or solutions. The number of people involved in group decision-making varies greatly, but often ranges from two to seven. The individuals in a group may be demographically similar or quite diverse. Decision-making groups may be relatively informal in nature, or formally designated and charged with a specific goal. The process used to arrive at decisions may be unstructured or structured. The nature and composition of groups, their size, demographic makeup, structure, and purpose, all affect their functioning to some degree. The external contingencies faced by groups (time pressure and conflicting goals) impact the development and effectiveness of decision-making groups.

The strategy of supply chain has been shown by Fig: 1.

Fig: 1. Strategy of supply chain

III. CASE STUDY

Procedural hierarchy: case application

In order to trace the sick and strong chief drivers of T-G-L-A-R supply chain of a firm, a Fuzzy Performance Importance Index (FPII), which is explored to identify sick and strong? FPII combines the performance rating and importance grade of various 1st level indices. The higher the FPII of a factor, the higher is the contribution. The concept of FPII was introduced by (Sahu et al., 2017f,g) for measuring same.

$$FPII_{ij} = w'_{ij} \otimes U_{ij} \qquad (1)$$

Here, $w'_{ij} = [[(1,1,1,1;1)] - w_{il}]$

U_{ij} is the rating and w_{ij} is the importance weight of j_{th} index (at 2nd level). Table: 2-4 have depicted the linguistic information given by DM supported by linguistic scale Sahu et al., 2016a,b,c,d,e,f.

Fuzzy Performance Importance Index (FPII) has been computed against each of the 1st level evaluation indices and FPII values are shown.

After evaluation the FPII values, the crisps scores corresponding to FPII of individual 1st level indices have been computed by exploring the concept of 'incentre of centroid' method ; the ranking order of various performance indices has been determined and it shown in Table 5.

IV.CONCLUSION:

Presented Decision support systems (DSSs) might assist the mangers of manufacturing firms towards identifying the sick and strong drivers 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 the indices too under similar supply chains. The ranking order has shown by bar chart in fig: 2.

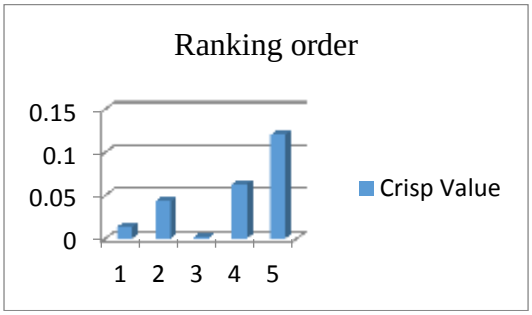

Fig:2 Bar chart

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Table: 1 G-F-A-L-R SC appraisement 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	1st level driver	2nd level indices
Fuzzy-Performance measurement of A firm under G-F-A-L-R supply chain, (C)	Greenness,C_1	Green service,($C_{1,1}$)
		Green advertisement,($C_{1,2}$)
		Green delivery,($C_{1,3}$)
		Emotional purchase,($C_{1,4}$)
		Competitive advantage in adopting green strategies,($C_{1,5}$)
		Cost of environmentally friendly goods,($C_{1,6}$)
	Flexibility,C_2	Flexibility in volume of product,($C_{2,1}$)
		Sourcing Responsiveness,($C_{2,2}$)
		Adaptability of delivery time by suppliers,($C_{2,3}$)
		Suppliers delivery time,($C_{2,4}$)
	Agile,C3	Responsiveness against supplier,($C_{3,1}$)
		Complain,($C_{3,2}$)
		Expedite managerial involvement,($C_{3,3}$)
		Customer care,($C_{3,4}$)
	Lean ,C_4	Waste reduction, ($C_{4,1}$)
		Responsiveness, ($C_{4,2}$)
		Customer response adaptation, ($C_{4,3}$)
		Development of policy to reduce waste, ($C_{4,4}$)
	Resilient,C_5	Increased preparedness to disturbances, ($C_{5,1}$)
		Supplier development, ($C_{5,2}$)
		Team experience, ($C_{5,3}$)
		Financial position, ($C_{5,4}$)

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Table 2: Weights of 2nd level indices assigned by DMs

2nd level indices	Weights of 2nd level indices assigned by DMs		
	DM1	DM2	DM3
C_{11}	H	H	VH
C_{12}	MH	H	H
C_{13}	H	MH	MH
C_{14}	MH	MH	MH
C_{15}	MH	MH	MH
C_{16}	MH	MH	MH
C_{21}	VH	VH	DH
C_{22}	H	VH	DH
C_{23}	VH	H	VH
C_{24}	DH	H	H
C_{31}	MH	H	MH
C_{32}	H	MH	H
C_{33}	MH	M	MH
C_{34}	MH	M	H
C_{41}	H	MH	ML
C_{42}	MH	M	M
C_{43}	M	MH	ML
C_{44}	MH	MH	L
C_{51}	L	ML	L

C_{52}	VL	ML	ML
C_{53}	ML	L	ML
C_{54}	DL	L	L

Table 3: Weights of 1st level drivers assigned by DMs

1st level indices	Weights of 1st 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 2nd level indices assigned by DMs

2nd level indices	Rating of 2nd 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

Table 5: Ranking order of 1st level drivers

2nd level indices	FPII	$R(\tilde{A})$ Crisp Value	Ranking Order
C_1	[0.061, 0.051, 0.028, 0.013; 1]	0.013	4
C_2	[0.176, 0.178, 0.074, 0.031; 1]	0.043	3
C_3	[0.015, 0.005, 0.000, 0.000; 1]	0.001	5
C_4	[0.175, 0.200, 0.193, 0.162; 1]	0.063	2
C_5	[0.116, 0.203, 0.420,0. 627; 1]	0.120	1

