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Analysis of Administration/Financial Measures (A/FM) Related Measures by Using Analytic Hierarchy Process (AHP)

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Abstract: Authors have suggested improving the administration/financial measures in the SCM system of l Tratec Engg. Pvt. Ltd. industry by used Analytic Hierarchy Process (AHP). In this process collect the data and found dependency to each other. data was analyzed by based on higher priority .to select the process according to these rank Set in the parametric form and arrange in the rank of process according to these priority. These ranks arrange their higher to lower priority.
KeyWords: I / R,CCCT, ROI / CE, IE, RPE, CF, SVF, ROA , OVF, VC

I. INTRODUCTION

A supply chain is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials, and components into a finished product that is delivered to the end customer. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable. Supply chains link value chains.

The Council of Supply Chain Management Professionals defines supply chain management as follows: "Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with in and across marketing, sales, product design, finance and information technology." A typical supply chain begins with the ecological, biological, and political regulation of natural resources, followed by the human extraction of raw material, and includes several production links (e.g., component construction, assembly, and merging) before moving on to several layers of storage facilities of ever-decreasing size and increasingly remote geographical locations, and finally reaching the consumer.

Many of the exchanges encountered in the supply chain are therefore between different companies that seek to maximize their revenue within their sphere of interest, but may have little or no knowledge or interest in the remaining players in the supply chain. More recently, the loosely coupled, self-organizing network of businesses that cooperates to provide product and service offerings has been called the Extended Enterprise. Guaranteeing acceptable conditions in a global supply chain can be a complex challenge. As part of their efforts to demonstrate ethical practices, many large companies and global brands are integrating codes of conduct and guidelines into their corporate cultures and management systems. Through these, corporations are making demands on their suppliers (facilities, farms, subcontracted services such as cleaning, canteen, security etc.) and verifying, through social audits, that they are complying with the required standard.

A. Data Collection

Questionnaires will serve as the data collection methodology, as it falls within the broader definition of ‘survey research’ or ‘descriptive survey’. Remenyi et al. (2002), defines the concept of ‘survey’ as, “the collection of a large quantity of evidence usually numeric, or evidence that will be converted to numbers, normally by means of a questionnaire”. A questionnaire consists of a list of questions compiled in order to elicit reliable responses from a chosen sample with the aim to determine what the participants do, think or feel. There are two approaches in structuring questions namely, positivistic (structured ‘closed’ questions), and

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phenomenological (unstructured 'open-ended questions). The sample frame will consist of SME owners, managers, and line supervisors.

II. LITERATURE SURVEY

Haifeng Song(2015) Case Company: Anhui Welbon Gaosen Paper Co.,Ltd - There are three main aspects will be elaborated in conclusions chapter, the whole thesis from start to finish will be briefly summarized, author's work will be self evaluated, and the thesis limitations will be pointed out. The structure of thesis was divided into six sections which consist of introduction, introduction of case company, literature review, JIT procurement supplier selection process, results and discussion, and finally conclusions. In the first introduction part, the author gives a short description of thesis background, problems which the case company facing and thesis objectives were stated, research methods were mentioned and the framework of the thesis was introduced. In introduction of case company chapter, the author presented specialty paper industrial background, the basic information of case company and related department description. In literature review chapter, three main theory plates were reviewed, which are purchasing, supplier selection and AHP method, purchasing plate involved purchasing behavior, purchasing objectives, purchasing importance, procurement process and JIT procurement; supplier selection part included supplier selection models, supplier selection process, supplier selection criteria and supplier relationship management; AHP method combined definition, typical application process and theoretical limitations. JIT procurement supplier selection process consisted of supplier selection criteria identification and AHP application, both questionnaires research and interview research methods were utilized to accumulate data and information for the goal. After practical research and calculation, results and discussion phrase comprised of results analysis and supplier relationship management suggestions for JIT implementation, which combined with the results and realistic situation of the case company. Concerning the question on no scientific evaluation system for vendor selection, AHP method as a scientific and logic system was utilized for selecting vendor, quantitative 53 research of questionnaire was used to accumulate input data for pair-wise comparison, eigenvectors and eigenvalues of groups' judgment matrixes were calculated for ranking priorities. All vectors were passed by consistency verification. The question of no specific supplier selection criteria in line with the actual situation of company was solved by using literature review, qualitative research and quantitative research, more specific, accumulating amount of indicators through literature review, collecting company procurement information through interview method and identifying final selection criteria through questionnaire method. Regarding the question on how to maintain supply relationship during JIT implementation, the author gave four specific suggestions in supplier relationship management. Based on previous research process, the limitation of the thesis were, firstly, related small amount of interview participant and questionnaire fulfilling respondents as the result of limited time and condition, if participants and respondents increased, the final result will be more persuasiveness. Secondly, the limitation of thesis was the limitation of AHP methodology that the final score missing practical explanations, for instance, the decision makers may not know the significant difference between two alternatives whentheir final score are close. AHP is created according to human nature and mind and goes with it. The procedure is an array of judgments (decisions) and individual assessment in a reasonable way. Consequently, AHP may depend on personal impressions and experiences to frame and design a program hierarchically. Besides, all the decision-making and final judgments are mainly depends on logic, understanding and experiences. (Bitarafan, Hosseini, Abazarrlou & Mahmoudzadeh 2015) As one of the excellent multiple MCDM methods, AHP help DMs make decision based on pair-wise comparison between criteria and alternatives. In AHP, a pair-wise comparison is defined in the linguistic scale of crisp value. (Abdullah & Zulkifli 2015)

A. A typical AHP Includes the Following Four Steps

1) "Define the evaluation criteria for the decision goal and establish a hierarchical framework.
2) Compare the pair-wise decision elements.
3) Estimate the relative weights of decision elements.
4) Rate the decision alternatives based on aggregated weights of decision elements.

III.RESEARCH METHODOLOGY

A. Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP), introduced by Thomas Saaty (1980), is an effective tool for dealing with complex decision making, and may aid the decision maker to set priorities and make the best decision. By reducing complex decisions to a series of pairwise comparisons, and then synthesizing the results, the AHP helps to capture both subjective and objective aspects of a decision. In addition, the AHP incorporates a useful technique for checking the consistency of the decision maker's evaluations, thus reducing the bias in the decision making process.

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B. Research Methodology

1) Stage 1: It includes the collection, combination and integration of non–numerical data based on literature review.

2) Stage 2: Results of the stage 1 are utilized to develop a structured questionnaire to measure supply chain performance of industries. This questionnaire is used for field investigations, inputs from practitioners, academicians and expert's interviews of the concerned area.

3) Stage 3: Ranking of the KPIs of Indian manufacturing SCs is done using AHP.

4) Stage 4: The results are used to generate the common set of metrics for the Indian manufacturing supply chain.

5) Stage 5: An implementation framework/Performance Measurement System (PMS) for supply chain performance measurement in industries is generated.

IV. DATA ANALYSIS

The objective of this study is to determine how KPIs can be utilized for developing supply chain performance measurement framework. Questionnaire survey was conducted to collect the required data regarding KPIs and supply chain performance measurement in the Indian manufacturing organizations.

A/FM	CCCT	OVF	ROA	VC	RPE	ROI/CE	CF	I/R	RPE	IE	EV	EVEC
I/R	1	2	2	2	2	4	4	4	6	8	2.94	0.21
IE	0.5	1	2	2	2	2	4	5	6	8	2.44	0.17
RPE	0.5	0.5	1	3	3	3	3	5	5	7	2.26	0.16
ROA	0.5	0.5	0.33	1	3	3	3	4	5	7	1.77	0.13
VC	0.5	0.5	0.33	0.33	1	3	3	3	5	7	1.38	0.10
CCCT	0.25	0.5	0.33	0.33	0.33	1	3	3	4	6	0.99	0.07
OVF	0.25	0.25	0.33	0.33	0.33	0.33	1	3	4	4	0.71	0.05
CF	0.25	0.2	0.2	0.25	0.33	0.33	0.33	1	7	7	0.58	0.04
VC	0.16	0.16	0.2	0.2	0.2	0.25	0.25	0.14	1	5	0.31	0.02
ROI/CE	0.12	0.12	0.14	0.14	0.14	0.16	0.25	0.14	0.2	1	0.18	0.01
SUM	4.03	5.73	6.86	9.58	12.33	17.07	21.83	28.28	43.2	60	13.56	0.98

[λ max= 11.15, CI= 0.127, RI=1.49, CR=0.093, i.e. < 0.100 (Consistent)]

Table : Synthesizing matrix for A/FM

	1		2		2		2		2		4
	0.5		1		2		2		2		2
	0.5		0.5		1		3		3		3
	0.5		0.5		0.33		1		3		3
0.21	0.5	0.17	0.5	0.16	0.33	0.13	0.33	0.10	1	0.07	3
	0.25		0.5		0.33		0.33		0.33		1
	0.25		0.25		0.33		0.33		0.33		0.33
	0.25		0.2		0.2		0.25		0.33		0.33
	0.16		0.16		0.2		0.2		0.2		0.25
	0.12		0.12		0.14		0.14		0.14		0.16

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	4		4		6		8		2.27
	4		5		6		8		1.79
	3		5		5		7		1.77
	3		4		5		7		1,36
0.05	3	0.04	3	0.02	5	0.01	7	=	1.03
	3		3		4		6		0.74
	1		3		4		4		0.53
	0.33		1		7		7		0.47
	0.25		0.14		1		5		0.24
	0.25		0.14		0.2		1		0.14

Now, estimating the consistency ratio as follows: for the value of λ max, the weighted sum matrix for manufacturing related Measures is calculatedas follows.For the value of λ max computing the average of the above values

Now, dividing all the elements of the weighted sum matrices by their respective priority vector element:

2.27/0.21=10.8, 1.79/0.17=10.5 , 1.77/0.16=11 ,1.36/0.13=10.4, 1.03/0.10=10.3,

0.74/0.07=10.5, 0.53/0.05=10.6, 0.47/0.04=11.7, 0.24/0.02=12, 0.14/0.01=14

$$\text{Amax} = \frac{10.8+10.5+11+10.4+10.3+10.5+10.6+11.7+12+14}{10} = 11.18$$

Here, value of n=10(size of matrix 10x10)now the consistency index, CI is:

$$CI = \frac{\text{Amax}-n}{n-1}$$

$$CI = \frac{11.10\ 10}{10-1} = 0.1311$$

Selecting appropriate value of random consistency ratio 'RI' for a matrix of size **(n=10)** using Table 2 (RI = 1.49). Now,calculating the value of consistency ratio 'CR' as follows:

$$CR = \frac{CI}{RI} = \frac{0.1311}{1.49} = 0.093$$

Since, the value of CR= 0.093, i.e. < 0.100. Hence, the solution is consistent, which is in the acceptable range.

A. Graphical Illustration Of Survey Result

1) *Scale used in survey* (1=EUI=ExtremelyUnimportant, 2=UI=Unimportant, 3=SUI=Somewhat Unimportant, 4=N=Neutral, 5=SI=Somewhat Important, 6=I=Important, 7= EI=Extremely Important) forms. In the questionnaire, seven point Likert scale was used where 1 refers to EUI = Extremely Unimportant, 2 refers to UI = Unimportant, 3 refers to SUI = Somewhat Unimportant, 4 refers to N = Neutral, 5 refers to SI= Somewhat Important, 6refers to I= Important, 7 refers to EI=Extremely Important.

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B. Rankings Obtained By Ahp Analysis

The results are drawn from the above tables of each criteria/factor. Greater the value of GP/GR (Global Priority/Global Rank), greater is the rank corresponding to that KPI/Head. So, column wise values of GP/GR of each table are arranged in decreasing order and then allotted the simultaneous rank from 1 to n (n= Number of KPIs/Heads in that respective table).In this manner the following ranks are obtained.

Administration/Financial measures(A/FM)	
Rank 1	Income / Revenues (I / R)
Rank 2	Invoice errors (IE)
Rank 3	Revenue per employee (RPE)
Rank 4	Return on assets (ROA)
Rank 5	Various costs (VC)
Rank 6	Cash to cash cycle time (CCCT)
Rank 7	Orders versus forecasts (OVF)
Rank 8	Cash flow (CF)
Rank 9	Various costs (VC)
Rank 10	Return on investment / Capital employed (ROI / CE)

V. RESULT

The analysis illustrates the order of importance of both the heads and KPIs corresponding to consistency performance. Now, these KPIs with their order of respect can be used to construct a framework for supply chain measurement in industries. Priority of findings of the research proved that supply chain can be improved by changing key performance indicators (KPI_S).

VI. CONCLUSION

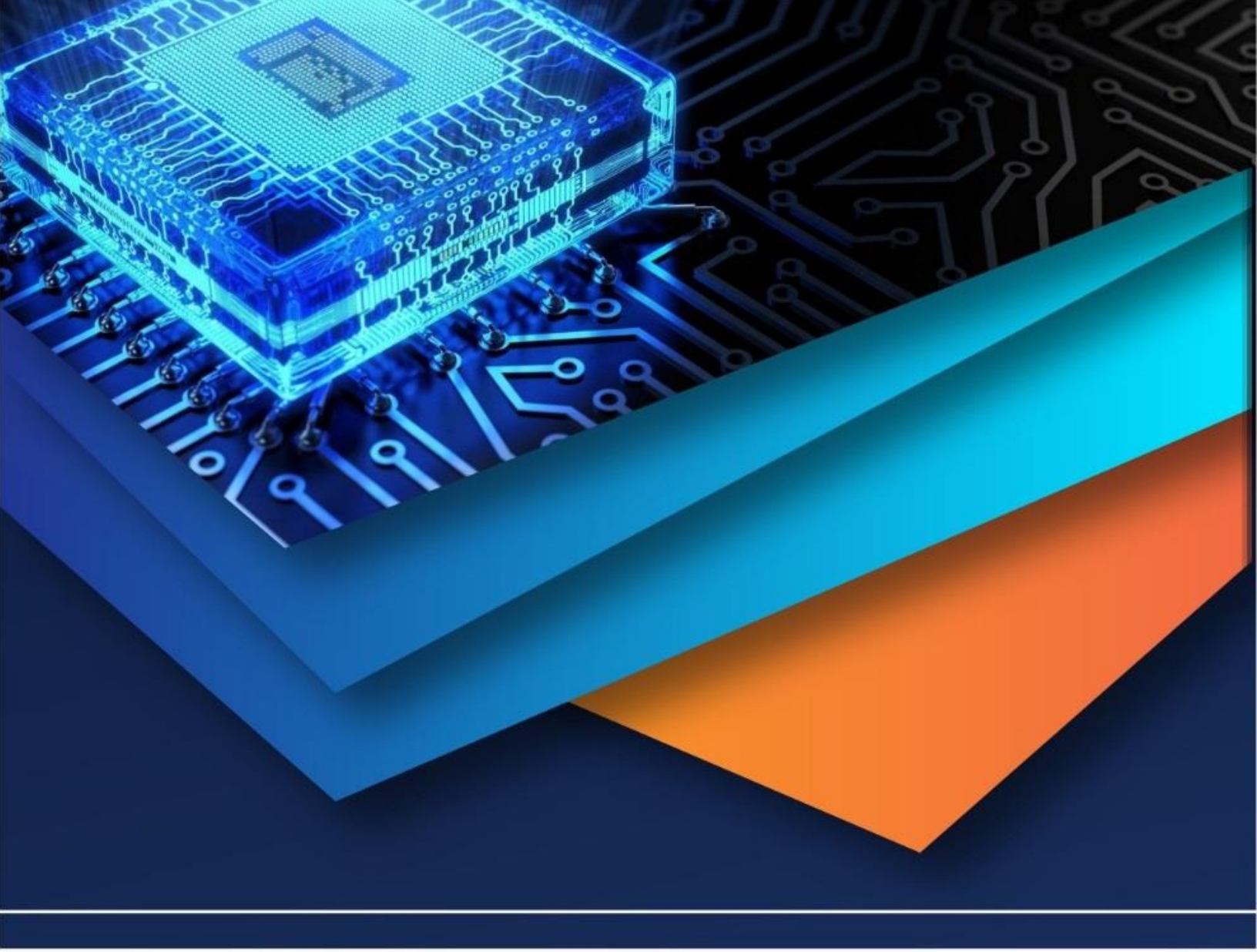
Considering the complexity of the supply chain performance measure in industry the challenge of managing an supply chain performance may be better appreciated. Despite the complexity of supply chain performance there is an increasing service and product qualities.

A new concept to improve supply chain performance has framed by changing the priority index of factor which affecting supply chain performance.

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