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Fuzzy AHP Approach: Performance Evaluation of Service Supply Chain Process In Healthcare Industry

Bhawna Singh & Dr.Rushina Singhi

Volvo Line Lubricants & solutions Pvt. Ltd.

Address for Correspondence: editojohp@gmail.com

ABSTRACT

Service Supply process plays an important role in the healthcare industry as it is involved in providing the best services to the patient in a timely manner. So, it is important to continuously monitor the performance of the process. This study aims to evaluate the performance of service supply chain process with the help of Fuzzy AHP (Analytical Hierarchy Process) approach. As service supply chain is a very wide area to study so three critically important areas has been identified and studied i.e Supplier Relationship Management (SRM), Internal Supply Chain Management (ISCM) and Customer Relationship Management (CRM). The study was conducted in three major healthcare industries by organizing a Questionnaire Survey and based on Fuzzy AHP method, mathematical calculations have been done to evaluate the weightage of each performance in dicator in the irrespective are as and based upon the weight age Fuzzy AHP priority ranking have been given to them for analyzing the impact of each performance indicator. It has been observed from the weightage obtained after the mathematical calculations that each indicator plays a decisive role in continuous functioning for the completeprocess.

Key Words: Service Supply Chain Process, Supplier Relationship Management (SRM), Internal Supply Chain Management (ISCM), Customer Relationship Management (CRM), Operational Performance, Fuzzy AHP Analysis.

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INTRODUCTION

Service supply chain is now defined in a manner by differentiating it from standard Supply chain focusing on manufacturing area. (Ellram, L.M., Tate, W.L., & C, 2004) defines service supply chain as “the management of information, processes, capacity, service performance and funds from the earliest supplier to the ultimate customer”. SCM is also playing an important role in service industries by providing services to the people through hospitals, hotels, elderly care and other social services. Services are differentiable from physical products in many ways like services are intangible, require laborious work, cannot be resold, cannot be stored and transported, automation is not possible and heterogeneous and most importantly the quality of services while delivering it to the customers (Nie & Kellogg, 1999).

Over the past 50 years, there is an increasing growth in the service industry which accelerates the requirement of new ideas and advancement in service growth to increase the economic growth.

Service marketing management and service operations management are the booming fields in which many types of research have been done but very few research has been done to investigate how value creation can be done by the service providers by integrating their processes which will enlarge their organizational boundaries (L., W., & C., 2007).

As the world is changing dramatically, the perception of people towards the performance of the services is critically important for the success or failure of any company, so for companies to maintain and meet the customer’s expectations towards their services is getting difficult so to overcome this there is a necessity to develop robust framework for supply chain management processes in area of services. This will help in cost reduction, improvement in delivering of services, reduce dependability, increase in service quality and therefore increment in revenues (Giannakis, 2011). The efforts put in to make conceptual models for understanding service supply chains has given an opportunity to know the difference between the service and manufacturing industries.

The healthcare industry focusses on proving best health care at lower cost and with continuous addition of improving technologies to serve the best healthcare services to the patients but to fulfill this, they face many challenges as they have limited resources and a lot of investments. Therefore, the focus of the management is to manage the resources by taking care of the healthcare operations. Thus, they adopt various process improvement techniques to smoothen their processes and minimize the wastages. Further after any implication, they keep a check on the performance of every process to figure out any gap area and scope for improvement. Many techniques like six sigma, business process re-engineering, fuzzy AHP approach, SERVQUAL has been utilized for the performance improvement and evaluation (Adebanjo, Laosirihongthong, & Samaranayake, 2016).

Fuzzy AHP method was developed to evaluate the uncertain judgments and to give the exact numerical values which the traditional AHP method fails to provide. As stated by (Negotia, 1985) “the fuzzy set theory is that an element has a degree of membership in a fuzzy set. Many fuzzy AHP methods were proposed by various researchers like (Chan & N., 2007), (Chen & C., 2010), (Kilincci & S., 2011) and the common idea behind every method is the concepts of fuzzy set theory and hierarchical analysis. In this paper, Chang's fuzzy extend analysis has been utilized for evaluation for performance evaluation of service supply chain process.

LITERATURE REVIEW

Supply chain process with service dominance is coming out to be the innovative concept. Supply chain process has been developed tremendously and it has arrived at a stage where the products are not thought as tangible but also the value in it is gaining importance (Spohrer, Maglio, Bailey, & Gruhl, 2007). Service dormancy has changed the concept of the supply chain as researchers have been done (Lusch, Vargo, & Tanniru, 2009).

The measurement of service supply chain process plays a very critical role and their features need to be taken into consideration. Many papers have been published focusing on measuring performance in an operational setting in the manufacturing sector but there is no focus on measuring performance in an operational setting in the service sector (Yasin & Gomes, 2010).The five dimensions of service quality i.e. responsiveness, empathy, reliability, tangibility, and competence called SERVQUAL has been proposed by (Parasuraman, Zeithaml, & Berry, 1988) for measuring the performance of service quality. Like this many researcher had given different dimensions. (Jin & Tian, 2012) constructed an optimization model to measure performance contracts in association with logistics service in supply chain process. The model gives the theoretical insights about the tradeoff between inventory level and reliability designcan be driven by logistics services. (Mirzahosseinian & Piplani, 256-261) studies the performance of supply chain process with respect to repairable parts services in performance-basedcontracts.

One more research conducted by (Song & Yu, 2009) conducts that service supplier does notonly connects a resolution with the business process but also focusses on increasing the customer value by focusing on logistics, engineering, financial and administrative tasks. By focusing on every area and inclusion of different upcoming techniques and opportunities organizations are continuously working in improving their service supply chain processes and closely monitoring it for better results and avoiding the gaps which can hamper the process. (Yu, Chatterjee, & Jia, 2016)

The Fuzzy-AHP methodology is the technique of integrating the fuzzy set theory and analysis of hierarchical structure for making decisions for various problems and opting for best solutions

(Cho, Lee, Ahn, & Hwang, 2011). Earlier, AHP has been used to solve many multi- dimensional problems but it enables the decision makers to give an exact value which is quantifiable as they can only provide subjective and undefined answers (Shaw, Shankar, Yadav, & Thakur, 2012).

By using Fuzzy AHP approach decision makers able to provide decision which is both qualitative and quantitative. In this method, triangular fuzzy numbers are used to set the preference of opting one standard over another and further analyzing the pair wise comparisonas proposed by (Zadeh & L.A., 1965). Many theories had been discovered in the past but fuzzy comes out to be a reliable decision-makingmethod.

A fuzzy set is studied on the universe R as the convex and normalized fuzzy set. A triangular fuzzy number A with membership function $\mu A(X)$ is defined on R as

$$\mu_{A(x)} = \begin{cases} 0, & x < l \text{ or } x > m \\ (x-1)/(m-l), & l \leqslant x \leqslant m \\ (x-u)/(m-u), & m \leqslant x \leqslant u, \end{cases}$$

------- Equation 1

Where l≤m≤u and l and u reflect the low and high values of A respectively, and m is the middle value of A. If l=m=n then they are non-fuzzy numbers by convention. The operational laws for two positive triangular numbers i.e

A= (l1, m1,u1)

B= (l2, m2,u2)

is defined as

A + B = (l1 + l2, m1 + m2, u1+u2) Equation2

A - B = (l1 - l2, m1 - m2, u1- u2) Equation3

A X B = (l1l2,m1m2,u1u2) Equation 4

ʎ X B = (ʎl1, ʎm1, ʎu1), ʎ > 0, ʎЄR Equation 5

A^{-1} = (1/u1,1/m1,1/l1) Equation6

The steps as defined by (Rezaie, Ramiyani, Nazari-Shirkouhi, & Badizadeh, 2014)Rezaie, K., Ramiyani, S., Nazari-Shirkouhi, S., & Badizadeh, A. (2014) in Fuzzy AHP Approach were:

1. Determine criteria and establish hierarchicalstructural.
2. Collectexpertsjudgementsbasedonfuzzyscaleandestablishfuzzypairwisecomparison matrices.
3. Defuzzying the fuzzy pair wise comparison matrices.
4. Calculate consistency ratio and derive result.

RESEARCH DESIGN

The research design is quantitative and inferential. Fuzzy AHP analysis method has been applied in service supply chain process of healthcare sector as it is the most under privileged but most important area which plays an equally important role as the other existing areas.

DATA COLLECTION

A questionnaire has been designed and ratings has been taken from 3 major healthcare organizations on the linguistic scale. The ratings then converted into fuzzy scale to do the mathematical calculation on linguistic values. Below mentioned is the table based on which conversions are done.

Figure 1 Linguistic scale conversion on Triangular fuzzy conversion scale

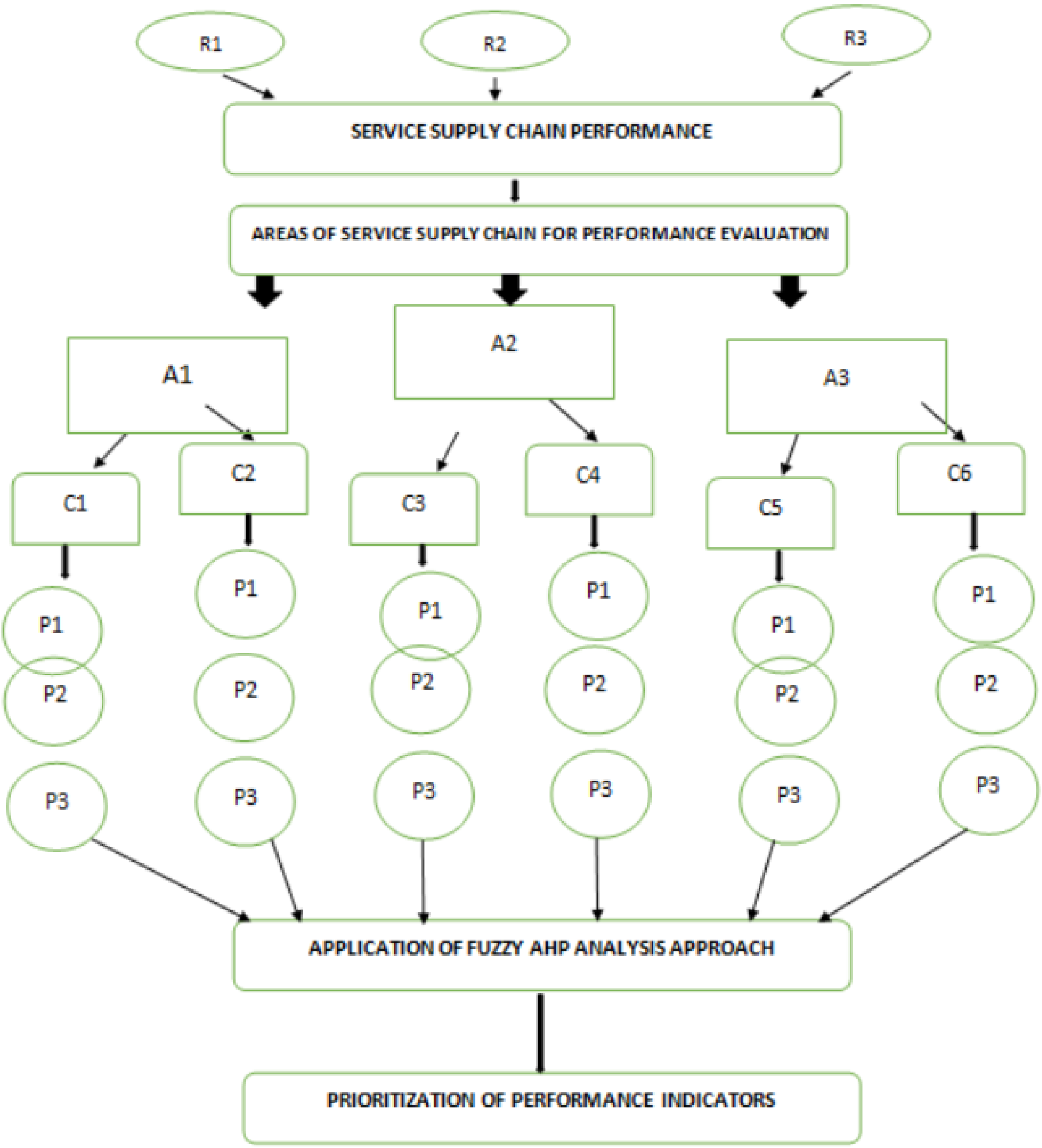
Linguistic Scale	**Fuzzy scale**	**Fuzzy Reciprocal Scale**
Equal	(1,1,1)	(1,1,1)
Similar	(1/2,1,3/2)	(2/3,1,2)
More important	(1,3/2,2)	(1/2,2/3,1)
Important	(3/2,2,5/2)	(2/5,1/2,2/3)
Very Important	(2,5/2,3)	(1/3,2/5,1/2)
Extremely Important	(5/2,3,7/2)	(2/7,1/3,2/5)

RESEARCH METHODOLOGY

After the evaluation and feedback of the questionnaire performance indicators for each area has been identified and based on Fuzzy AHP method, mathematical calculations have been done to evaluate the weightage of each performance indicator in their respective areas and based upon the weightage Fuzzy AHP priority ranking has been given to them for analyzing the impact of each performance indicator. After that coefficient of closeness is also being calculated. A conceptual model is also designed to closely understand the relationship between the assessment areas and performance indicators.

Assessment area	Criteria	Performance Indicators
Supplier Relationship Management (SRM)- A1	Supplier Selection- C1	Quality of services- P1
		Timely delivery of services- P2
		Risk initiatives shared by suppliers- P3
	Sourcing Strategies- C2	Flexibility of services- P1
		Performance of promised services- P2
		Lead time for services- P3
Internal Supply Chain Management (ISCM)- A2	Demand Management- C3	Accuracy of forecasting techniques- P1
		Effectiveness of scheduling techniques- P2
		Alternative availability of resources in case of non-availability- P3
	Strategy Planning- C4	Return on investment- P1
		Optimum utilization of resources- P2
		Cost involved in process- P3
Customer Relationship Management (CRM)- A3	Tangibility to Customers- C6	Range of services- P1
		Best rates to the customers- P2
		Providing prompt information to the customers regarding any query related to services- P3
	Empathy- C6	Customer loyalty- P1
		Customer relationship- P2
		Customer satisfaction- P3

Conceptual Model



DATA INTERPRETATION

Step 1 : Judgemental Ratings of Organization's Representatives :

Firstly ratings of three representatives i.e. R1 , R2 & R3 has been defined as mentioned below:

	R1	**R2**	**R3**
R1	1	1/2	1/3
R2	2	1	1/4
R3	3	4	1

Eigen vector value has been obtained by evaluating the above matrix by using AHP Method. The normalized eigen vector values obtained are as follows: 0.4228 , 0.2710 & 0.2188 . The Consistancy index (CI) value is found to be 0.018282 and Consistancy Ratio (CR) value is 0.028878.

Step 2 : The importance of conventions is defined on the scale of 1-4 , based on the judgement of the organization's representatives.

Figure 2 : Convention importance rating by organization's representatives

Convention	Representatives		
	R1	R2	R3
C1	MH	H	VH
C2	H	MH	VH
C3	VH	MH	H
C4	H	H	MH
C5	MH	VH	MH
C6	VH	VH	MH

Step 3 : Now on six point linguistic scale performance ratings has been awarded to each convention as Poor , Medium Poor , Fair , Medium Good , Good and Very Good .

Figure 3 Performance ratings by organization's representatives

Convention	Representatives			
	Performance Indicators	R1	R2	R3
C1	P1	VG	G	MG
	P2	F	MG	F
	P3	MP	P	G
C2	P1	MG	MG	VG
	P2	VG	MG	P
	P3	G	MG	G
C3	P1	VG	G	MG
	P2	MG	VG	F
	P3	G	MG	VG
C4	P1	VG	MG	VG
	P2	MG	G	P
	P3	MP	MP	MG
C5	P1	G	MP	MG
	P2	MG	VG	G
	P3	VG	MP	F
C6	P1	MG	F	VG
	P2	MG	VG	P
	P3	VG	F	G

Figure 4 Fuzzy rating criteria by organization representatives

Criteria	**Representatives**		
	R1	R2	R3
C1	(1.0,1.0,1.0)	(1.0,1.0,1.0)	(0.8,1.0,1.0)
C2	(0.8,1.0,1.0)	(1.0,1.0,1.0)	(0.8,1.0,1.0)
C3	(0.9,0.8,1.0)	(0.9,0.8,1.0)	(0.8,1.0,1.0)
C4	(1.0,1.0,1.0)	(1.0,1.0,1.0)	(1.0,1.0,1.0)
C5	(0.8,1.0,1.0)	(1.0,1.0,1.0)	(1.0,1.0,1.0)
C6	(1.0,1.0,1.0)	(1.0,1.0,1.0)	(0.9,1.0,1.0)

Figure 5 Performance ratings of sub criteria

Criteria	Representatives			
	Performance Aspects	R1	R2	R3
C1	P1	(7,8,9)	(7,8,9)	(8,9,9)
	P2	(5,6,7)	(6,7,8)	(7,7,8)
	P3	(7,8,9)	(6,7,8)	(8,10,10)
C2	P1	(10,10,10)	(10,10,10)	(10,10,10)
	P2	(8,10,10)	(6,7,9)	(10,10,10)
	P3	(10,10,10)	(7,8,10)	(10,10,10)
C3	P1	(8,9,10)	(8,10,9)	(7,9,10)
	P2	(8,8,10)	(7,9,10)	(8,10,10)
	P3	(10,10,10)	(9,9,10)	(9,9,10)
C4	P1	(9,9,9)	(10,10,10)	(8,9,10)
	P2	(8,8,10)	(8,8,9)	(10,10,10)
	P3	(8,8,9)	(7,7,9)	(9,9,10)
C5	P1	(9,9,10)	(8,8,9)	(10,9,10)
	P2	(9,10,10)	(8,8,10)	(10,10,10)
	P3	(8,7,10)	(8,8,9)	(9,9,10)
C6	P1	(10,10,10)	(8,9,9)	(10,10,10)
	P2	(9,9,10)	(8,8,10)	(9,10,10)
	P3	(8,8,10)	(7,89,9)	(10,10,10)

Figure 6 Fuzzy rating of sub criteria with weight of representatives

Criteria	Fuzzy rating criteria with weight of Representatives		
	R1	R2	R3
C1	(0.5219,0.5219,0.5219)	(0.3711,0.3711,0.3711)	(0.1151,0.1369,0.1369)
C2	(0.5407,0.3711,0.5219)	(0.3711,0.3601,0.3711)	(0.1151,0.1369,0.1369)
C3	(0.4095,0.4607,0.5219)	(0.2881,0.3241,0.3711)	(0.1151,0.1369,0.1369)
C4	(0.5119,0.5119,0.5219)	(0.3711,0.3711,0.3711)	(0.1369,0.1369,0.1369)
C5	(0.5407,0.5119,0.5219)	(0.3711,0.3711,0.3711)	(0.1369,0.1369,0.1369)
C6	(0.4547,0.5119,0.5219)	(0.3711,0.3711,0.3711)	(0.1369,0.1369,0.1369)

Figure 7 Performance fuzzy ratings of sub criteria with weight of representatives

Criteria	PerformanceAspects	R1	R2	R3
C1	P1	(3.0855,4.6065,5.2194)	(3.7811,3.4412,4.2013)	(1.1012,1.3771,1.2691)
	P2	(4.1716,4.3826,5.0765)	(2.4309,1.7621,2.3522)	(0.7434,2.0143,2.2112)
	P3	(4.4846,5.0955,3.5175)	(2.2518,1.4309,3.7821)	(2.1322,3.1731,5.3751)
C2	P1	(4.2124,4.2184,4.4564)	(4.5123,2.5112,1.5113)	(1.3751,1.4741,2.2481)
	P2	(5.5065,4.1493,3.1291)	(2.4209,5.8711,4.3512)	(1.3761,2.2441,2.2541)
	P3	(4.2184,6.2154,6.2194)	(5.7421,3.1262,3.4013)	(1.3211,2.1651,2.1631)
C3	P1	(5.3375,4.4294,5.3294)	(3.1212,3.6013,3.6013)	(2.1103,2.2022,3.1491)
	P2	(5.1944,5.4145,6.2144)	(4.3201,2.3214,6.3213)	(1.4202,2.1631,2.1531)
	P3	(4.1494,5.2154,4.7174)	(3.4741,2.1532,5.1113)	(2.2122,3.2411,2.1571)
C4	P1	(4.6055,4.2174,6.1434)	(4.5113,4.5113,2.5103)	(3.2132,2.1581,2.1671)
	P2	(5.1935,5.6173,3.1194)	(4.4109,3.7311,2.1522)	(2.2312,5.1731,2.1741)
	P3	(3.5526,3.1055,6.3045)	(1.4319,2.4411,2.2522)	(3.1473,2.2552,2.1891)
C5	P1	(5.5144,4.8294,6.3294)	(3.4219,1.7711,4.1112)	(1.762,1.0371,1.3670)
	P2	(5.0345,5.2105,6.2084)	(2.4311,5.1312,2.5113)	(1.1402,1.1781,1.1461)
	P3	(5.8215,6.5142,6.2204)	(3.5339,4.5511,4.1212)	(1.2312,1.1841,1.3771)
C6	P1	(4.5164,4.2204,4.2154)	(5.4119,3.6711,2.3222)	(2.3611,3.1691,3.1691)
	P2	(5.1433,6.3261,2.2254)	(5.7321,4.1722,5.3313)	(2.2602,3.1490,3.0691)
	P3	(3.2545,2.3065,3.0694)	(1.5169,3.0782, 3.7312)	(3.4012,2.1691,4.3471)

Step 4: Establishing fuzzy ratings under various criteria

The below step explains the calculation of fuzzy weights Wj of each criterion.

$\tilde{W}$ j = (wj1, wj2,

wj3) As w j1 =

min {wjk1}

$$Wj2 = 1/K\sum_{k=1}^{K} Wjk2$$

W j3 = max

{wjk3} For

criteria C11

W j1 = min {wjk1}

= min {0.4229, 0.2510,0.2141}

= 0.1230

W j2 = 1/3 {0.4229, 0.2510,0.2141}

= 0.4444

W j3 = max {wjk3}

= max {0.4229, 0.2510,0.2141

= 0.4216

Similarly weights for all the criterions are calculated:

Figure 8 Weights of criteria

C1	C2	C3	C4	C5	C6
(0.1241,0.2323,0.4211)	(0.1205,0.3216, 0.4211)	(0.1331,1.2212,0.3103)	(0.1317,0.2323,0.3102)	(0.1364,0.2423,0.3119)	(0.1361,0.2333,0.3101)

Step 5: Fuzzy ratings under various criterion for each performance metric.

The ratings obtained after calculating the aggregate weights of each criteria are mentioned in figure 9 which are defined as,

$\tilde{R}$ = (a ,b,c,)

Where,

a= min{ak}

$$b= 1/K\sum_{k=1}^{K} bk$$

c= max {ck}

So, for Performance Aspect 1 (P1) on the basis of criteria 1, a= min{ak}

= min { 4.1845,1.9721,2.4123}

= 1.2421

K

b= 1/$K\sum bk$

k=1

b= 1/3 { 4.1845,1.9721,2.4123}

= 4.1204

c= max {ck}

c= max{ 4.1845,1.9721,2.4123}

= 4.0283

Similarly, all the values have been calculated for each performance indicators.

Figure 9 Fuzzy performance ratings and weights

Performance Aspects	C1	C2	C3	C4	C5	C6
P1	(1.2411,2.1331,4.2032)	(2.1630,1.2642,4.2073)	(1.0122,1.2114,4.2172)	(1.2412,2.223,4.2132)	(1.3601,3.0721,4.2174)	(1.3402,3.3234,4.2154)
P2	(0.7432,1.7431,7.1342)	(1.1682,2.1021,4.2182)	(2.1013,1.1431,4.2144)	(2.1131,1.5416,4.1394)	(2.1422,2.1314,4.2084)	(1.3691,3.0921,4.1174)
P3	(1.2142,1.8262,1.2133)	(0.1682,2.1371,2.2181)	(2.1422,2.1223,4.1294)	(2.1263,2.7073,4.5175)	(1.2402,1.8213,4.5164)	(1.1402,2.2318,4.6185)
Weights	(0.2142,1.0842,1.4229)	(1.0142,1.0632 ,1.0211)	(0.2111,0.1032,0.3165)	(0.089,0.2323,0.6219)	(0.1069,0.3233,0.2319)	(0.1309,0.3323,0.5121)

Step 6: Calculation of normalized fuzzy ratings under variuos criterion for each performance indicator.

Figure 10 Normalized fuzzy performance ratings and weights

	C1	C2	C3	C4	C5	C6
P1	(0.2358,0.4543,1.0200)	(0.2448,0.4521,1.3200)	(0.1298,0.1135,1.6401)	(0.2158,0.4201,2.0400)	(0.2538,1.5191,2.6300)	(0.2212,1.3511,1.3030)
P2	(0.2109,0.3435,0.7200)	(0.2152,1.3202,1.3210)	(0.3221,1.4216,2.1311)	(0.2350,0.4614,2.3610)	(0.2175,1.4721,2.3600)	(0.2358,0.1051,1.2030)
P3	(0.1236,1.0212,1.7403)	(0.2431,1.3261,2.0000)	(0.4721,0.6356,1.3201)	(0.1439,1.0142,0.4300)	(0.1238,1.5410,2.5200)	(0.2211,1.6142,1.3121)
weights	(0.2141,0.2323,0.4219)	(0.2251,0.1817 ,0.4219)	(0.2351,1.3322,0.5125)	(0.2164,1.4223,1.4215)	(0.2114,1.5213,0.3112)	(0.1269,0.2333,0.4129)

Figure 11 Weighted normalized fuzzy performance ratings matrix

	C1	C2	C3	C4	C5	C6
V1	(0.0141,0.2430,0.2219)	(0.1345,0.1531,0.2316)	(0.0147,0.3344,0.2309)	(0.0144,0.1261,0.3215)	(0.1019,0.1023,0.3159)	(0.1232,0.2330,0.2219)
V2	(0.0321,0.2314,0.2135)	(0.3121,0.2128,0.4217)	(0.0212,0.1226,0.3219)	(0.1442,0.2612,0.4209)	(0.1253,0.2683,0.6213)	(0.0437,0.2718,0.3139)
V3	(0.2141,0.2121,0.3122)	(0.1363,0.2521,0.3215)	(0.1253,0.1334,0.2122)	(0.1245,0.2743,0.2407)	(0.1621,0.2912,0.3212)	(0.0325,0.2743,0.3627)

Step 7: Calculation of fuzzy positive ideal and fuzzy negative ideal solution.

This step describes the calculation of fuzzy positive (FPIS) and fuzzy negative (FNIS) ideal solution .

Figure 12 Distance between Pi (i= 1, 2, 3) and P+

	C1	C2	C3	C4	C5	C6	Sum
d1+ =d(P1,v+)	0.33211	0.23406	0.16739	0.13548	0.33004	0.37682	1.25443
d2+= d (P2, v+)	0.14674	0.29549	0.13746	0.20779	0.24272	0.27844	1.25115
d3+= d (P3, v+)	0.19043	0.23525	0.13757	0.18281	0.28246	0.19825	1.24002

Figure 13 Distance between Pi (i= 1,2,3) and P-

	C1	C2	C3	C4	C5	C6	Sum
d1- =d (P1, v-)	0.1857	0.22602	0.32424	0.22528	0.24321	0.265498	1.4764
d1- =d (P2, v-)	0.126115	0.23042	0.3212	0.25203	0.20125	0.215644	1.42368
d1- =d (P3, v-)	0.252719	0.21044	0.31202	0.2785	0.21268	0.28743	1.41167

Step 8: Calculation of Coefficient of Closeness (CCi) :

This step explains the calculation of closeness of coefficient for each performance indicator, CCi measures the distance to FPIS (V+) and FNIS (V-) by taking the closeness to FPIS.

The closeness coefficient can be calculated as

$$CCi = \frac{d^{-}}{di^{-} + di^{+}}$$

where i= 1, 2, …… m

Figure 14 Calculation of V+, V- and CCi

	D+	D-	D+ + D-	Cci
P1	1.2546	1.3254	2.7202	0.5203
P2	1.2421	1.3213	2.6745	0.5911
P3	1.1041	1.3211	2.5212	0.5612

Based on the values obtained of CCi, P2>P3>P1

CONCLUSION

Supply chain process in service industry plays a critical role in the proper functioning of the organization. In the healthcare industry, supplying the material on time is very critical as the consumables help in treatment and cure of the patient. So, for that proper planning and execution is important to ensure the timely supplies as any deficiency will directly affect the patient life. For achieving that target it is important for organizations to continuously evaluate the performance of the process. This study focuses on performance evaluation of the service supply chain with the help of Fuzzy AHP Approach. Based on the feedback received after the questionnaire survey being conducted performance indicators for each assessment area has been identified and then within the help of mathematical calculations Fuzzy priority rankings has been given to the weightages of each performance indicator of the irrespective assessment area, this helps in identifying the impact of Performance indicators on the process. The coefficient of close nessal so being calculated to further analyze the impact of each performance indicator. The resultant shows that every performance indicator plays a decisive role in performance evaluation of the process. This helps in proper decision making for enhancing and improving the process and thus minimizing the challenges and overcoming them. As service supply chain process is a wide process to study thus more research can be conducted in other assessment areas and suggest ways for continuousimprovement.

REFERENCES

1. Adebanjo, D., Laosirihongthong, T., & Samaranayake, P. (2016). Prioritizing lean supply chain managment initiatives in healthcare services operations: a fuzzy AHP approach. Production planning and control, 953-966.
2. Alan W.Mackelprang, J. L. (2014). The relationship between strategic supply chain integration and performance: A meta-Analytic evaluation and implications for supply chain management research. Journal of Business Logistics, 71-96.
3. Bongsug (Kevin) Chae, D. O. (2014). The impact of supply chain analytics on operational performance: a resource-based view. International Journal of Production Research, 4695-4710.
4. Bongsug(Kevin) Chae, C. Y. (2014). The impact of advanced analytics and data accuracy on operational performance:A contingent resource based theory (RBT) perspective. Decision Support Systems, 119-126.
5. Brien, S. F. (2012). A technology selection framework for integrating manufacturing within a supply chain. International Journal of Production Research, 2987-3010.
6. C.Souza, G. (2014). Supply chain analytics. Business Horizon, 595-605.
7. Chan, F., & N., K. (2007). Global supplier development considering risk factors using fuzzy extended AHP- based approach. Omega 35, 417-431.
8. Chang, & D.Y. (1995). Applications of the extent analysis method on fuzzy AHP . European Journal of Operational Research , 649-655.
9. Chen, L., & C., H. (2010). An integrated fuzzy approach for the selection of outsourcing manufacturing partners in pharmaceuticals R & D. International journal of production research, 7438-7506.
10. Cho, D. W., Lee, Y. H., Ahn, S. H., & Hwang, M. K. (2011). A framework for measuring the performance of service supply chain management. Computers & Industrial Engineering, 801-818.
11. Chrang, Z. C.-A. (2012). Designing a collaborative supply chain plan using teh analytical hierarchy process and genetic algorithm with cycle time estimation. International Journal of Production Research, 4426-4443.
12. Dominique Estampe, S. l.-L.-D. (2013). A framework for analysing supply chain performance evaluation models. Int. J. Economics, 247-258.
13. Ellram, L.M., Tate, W.L., & C, B. (2004). Understanding service supply chain management. The journal of supply chain management, 17-32.
14. Gang Wang, A. G. (2016). BIg data analytics in logisctics and supply chain managment: Certain investigations for research and applications. Int. J. Production Economics, 98-110.
15. Giannakis, M. (2011). Management of service supply chains with a service-oriented reference model: the case of management consulting . Supply chain management-An international journal, 346-361.
16. Hsinchun Chen, R. H. (2012). Business Intelligence and Analytics: from Big data to Big Impact. MIS Quarterly, 1165-1188.
17. Jin, T., & Tian, Y. (2012). Optimizing reliability and service parts logistics for a time varying installed base. European Journal of operational research, 152-162.
18. Kamran Rezaie, S. S.-S. (2014). Evaluating performance of Iranian Cement firms using an integrated

fuzzy AHP-VIKOR method. Applied Mathematical Modelling, 5033-5046.

19. Karthik Kambatla, G. K. (2014). Trends in big data analytics. J.Parallel Distrib. Comput., 2561-2573. Kilincci, O., & S., O. (2011). Fuzzy AHP approach for supplier selection in washing machine company.
20. Experts systems and applications, 9656-9664.
21. L., E., W., T., & C., B. (2007). Services supply chain management: the next frontier for improved organisational performance. California management review, 44-66.
22. L.Olson, B. C. (2013). Business Analytics for Supply chain: A dynamic capabilities framework.
23. International Journal of Information Technology & Decision Technology, 9-26.
24. Lusch, R., Vargo, S., & Tanniru, M. (2009). Service, value networks, and learning . Journal of the academy of marketing science.
25. Mirzahosseinian, H., & Piplani, R. (256-261). A study of repairable parts of inventory system operating under performance-based contracts. European Journal of Operational Reasearch, 2011.
26. Negotia, C. (1985). Expert systems and fuzzy systems. Menlo park: CA: Benjamin Cummings.
27. Nie, W., & Kellogg, D. (1999). How professors of operations management view service operations? .
28. Productions and operations management , 339-55.
29. Parasuraman, A., Zeithaml, V., & Berry, L. (1988). SERVQUAL: A multi-item scale for measuring consumer perceptions of service quality. Journal of retailing, 13-40.
30. Pero, T. S. (2015). Data Science,Predictive Analytics,and Big Data in Supply Chain Management:Current State and Future Potential. Journal of Business Logistics, 120-132.
31. Peter Trkman, K. M. (2010). The Impact of business analytics on supply chain performance. Decision Support System, 318-327.
32. Rezaie, K., Ramiyani, S., Nazari-Shirkouhi, S., & Badizadeh, A. (2014). Evaluating performance of Iranian cement firms using an integrated Fuzzy AHP-Vikor method. Applied Mathematical Modelling, 5033-5046