

Vendor Evaluation and Rating

Major Project by IRSS-2012

Group 2

Abhay Kumar Singh

Gaurav Kumar Singh

Nikhil Rawat

Ritesh Bhatia

Sandeep Singh

Shivam Dubey

What is Vendor Evaluation?

- Vendor evaluation is a system for recording and ranking the performance of a supplier in terms of a variety of issues, which may include delivery performance and the quality of the items. A process of vendor rating is essential to effective purchasing.
- Vendor selection is crucial because of its strategic importance especially when it comes to Government Supplies where money & quantities involved are generally very large.

Is it really needed?

- Many companies use a vendor evaluation tool that allows transaction data to be analyzed to give a comparison between vendors. The vendor evaluation uses criteria that have been determined by the purchasing department to compare vendors such as price, delivery reliability, delivery date adherence and quality of the item.
- There are any numbers of criteria that can be used in a comparison and these are usually weighted so that important criteria are given more credence. For example, a company may decide that quality of the items it receives from vendors is more important than price, which in turn is more important than delivery reliability.

So it's needed, but how to use it?

- Vendor Evaluation supports us in procuring both materials and external services, by making use of data .
- Railways will want to evaluate it's vendors based on different criteria. This evaluation may be useful in negotiations with the vendor.
- Vendor Evaluation will enable us to choose the most appropriate vendor for a specific requirement, and supports us in the continuous monitoring of existing supply relationships.

Vendor Rating

- Vendor rating is the result of a formal vendor evaluation system. Vendors or suppliers are given standing, status, or title according to their attainment of some level of performance, such as delivery, lead time, quality, price, or some combination of variables

Why Rate them?

- Assess and monitor supplier performance with a view to rewarding suppliers who meet expectations with on-going and future supply relationships.
- Provide accurate feedback to suppliers to highlight their strengths as well as their weaknesses (through the eyes of the customer) which can be used as an effective continuous improvement tool.
- Provide benchmark data, which will allow suppliers to establish where they are placed in relation to the best performers in their industry and hence improve overall competitiveness in the market.

- Helping minimize subjectivity in judgment and make it possible to consider all relevant criteria in assessing suppliers.
- Providing feedback from all areas in one package and hence specific action could be taken to correct identified performance weaknesses.
- Establishing continuous review standards for vendors, thus ensuring continuous improvement of vendor performance.
- To select vendors for further development.

What's there for Stores Department?

- Stores Department of the Indian Railway purchases capital goods, raw materials, equipment's, spares, intermediary products, office items etc. for all its divisions and departments.
- The company had no system to evaluate and rate its vendors based on their performance in the purchase department. The objective of our project is to study a vendor evaluation and rating system that incorporates the company's evaluation and rating criteria.

Will it be superhit for Railway procurement?

No it will be our blockbuster hit because

It will be our DDLJ

- D=Delivery
- D=Distinctive and Reliable
- L=Lajawab Price
- J=Justication both Technical and Financial

Delivery

- Selecting vendors with exceptional delivery ability eliminates the cost such as inventory costs, storage expenses, and the costs of transferring materials multiple times.
- Vendors with exceptional delivery ability provide value to a firm by reducing its risk of running out of material.
- Saves unnecessary transportation costs, reducing the need for storage and reducing the costs associated with inventory .

Distinctive and Reliable

- Distinction of vendors based on rating will help us in selecting vendors that provide exceptional quality
- Provide reliable products that conform to the firm's requirements
- This conformance saves the time and money.
- The assurance of quality minimizes the chance that defective material will initiate such a negative chain reaction.
- In addition, vendors who assure quality reduce the time and expense associated with returning materials

Lajawab Price

- Vendors offering a fair price provide the benefit of cost reduction to the buying firm, while also providing themselves with a fair profit.
- A mutually beneficial price allows suppliers to remain profitable and continue business. Firms that earn extremely low profit margins relative to their competitors are likely to either cut corners on quality or to exit the relationship.
- This flexibility provide value to firms by giving them the ability to seize opportunities or avert crises due to last minute changes. Last minute changes are sometimes unavoidable and flexibility is the key to surviving such changes .

Justification Technical and Financial

- Vendor Evaluation will give us more objectivity and give us both Technical and Financial justification for our decision
- Vendors offering exceptional technical capabilities provide firms with the ability to continuously improve their products in terms of quality and performance.
- Firms that are technology leaders rather than followers translates into the ability for the buying firm to be a leader in technology. In addition, firms that lead in technical capabilities are more likely to continually improve their products and equipment .
- Firms with financial and business stability increases the likelihood that the partnership will survive through tough times. Firms that are financially stable are likely to offer long-term relationships, quality products and development services . Hence, buying firms are likely to realize a mixture of the above benefits depending on their priorities.

Scope of Project

- Studying the present vendor rating system in IR
- Data collection from RCF, Kapurthala to understand the rating process and bring out drawbacks of the same
- Study of Taguchi loss function for calculation of vendor rating using data from SWR
- Study of BHEL rating system and comparison with IR formula
- Conclusion and recommendations

COMPUTATION OF SUPPLIER RATING IN INDIAN RAILWAYS

As per RB's letter No. 95/RS (IC)/165/34 dated 30th June 1997, supplier rating (Sr) is calculated for each purchase order placed on a vendor as per the formula given below:

$$Sr = 0.6 Qr + 0.4 Dr$$

Where Sr = Supplier's rating for a PO.

Dr = Delivery rating.

Qr = Quality rating.

Quality rating (Qr) is computed for each PO as under:

$$Qr = \frac{Qa}{Qs}$$

Where Qs= Total quantity supplied/ offered for inspection = (Qa+Qrr+Qcr)

Qa = Quantity accepted

Qrr = Quantity rejected during RITES inspection

Qcr = Quantity rejected during consignee inspection

Delivery rating (Dr) is computed for each PO as under:

$$Dr = \frac{Q_t + \sum Q_d(1 - K \times T_d / T)}{Q}$$

Where Q = Qty ordered.

T = Promised delivery time

Q_t = Qty supplied in time

Q_d = Qty delayed

T_d = time delay for quantity delayed.

K = Constant with value as 2.

Instructions regarding vendor rating

- Vendor evaluation shall not be applicable to purchase orders valued below Rs. 40,000.
- Firms with rating less than 40 per cent should be taken as unreliable and generally ignored for placement of purchase order.
- Exception: Administrative interest owing to reasons like inadequate sources, limited capacity, lower price etc.
- Vendors with less than 30 per cent vendor rating should be considered for deletion from the list of approved suppliers.
- Overall vendor rating : orders placed during the last three years (not less than 3).

Procedure for data collection from RCF:

- Few vendors were shortlisted based on recommendations from RCF officials.
- For the selected vendors, vendor ratings were taken from RCF MMIS for POs placed between 20/01/2012 to 20/01/15. The ratings have been tabulated below:

S.No.	Name of vendor	PL No.	No. of PO	Quality rating	Delivery rating	Supplier rating
1.	Railtech	23983100	4	100	99.61	99.85
2.	Railtech	42982121	3	100	80.09	92.03
3.	Gaurav Associates	33557445	4	100	83.01	93
4.	Gaurav Associates	33690145	3	100	69	87.6
5.	Competent Engineers	33555783	4	66.61	52.83	61.09
6.	Competent Engineers	33555795	4	30.2	22.01	26.92

- For a selected PL, “Item position with stock and dues” were obtained from MMIS.
- “Item position with stock and dues” provides us with the following data –
 1. PO no. and date along with Original DP and Extended DP.
 2. Ordered quantity and quantity delivered.

Rail Tech.

Pl Number 42982121

Description ELECTROLYTIC TOUGH PITCH COPPER TUBE DIA 20MM,12SWG

Ind Description ELECTROLYTIC TOUGH PITCH COPPER TUBE DIA 20MM,12SWG

Installation & COMMISSIONING NOT REQUIRED

Drawing IS 2501-LATEST & IS 191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)

Ind Drg IS 2501-LATEST & IS 191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)

Class Code ELEC ELECTRICAL Pl Status Active Dig Sectn 02 Dig Ofcl ()

Ward 28 Balance 316.85 U/Rcpt Qty of Live Po's 0.00 METRE Average Rate(Rs) 848.23

Source TDITM Mfg Eligibility Doc.No.:

Issues against WO of Current Year 155.82

Safety Item: NO

MEMUFTM 155.82

QPC %age: 100

Current Year Issues : 155.82

SAL Iss in Current Yr: 0.00

Year - 1 Issues : 289.38

Trade Gp.:

Year - 2 Issues : 300.51

Last Receipt Date & Qty.

Year - 3 Issues : 301.68

ABC Cat.: C

Current Year Receipts : 389.50

16/09/2014 135.30

Last Iss. Dt. & Qty. : 23/12/2014 22.26

Production Plan for 2014-2015

Issue QPC

Coach Type	Annual Target	Target(with BckLog)	Indent QPC	QPC %age	Total Reqmt.	Balance Coaches	Balance Reqmt.	QPC Status
MEMUFTM	22	22	11.13	100	244.86	0	0.00	UP

Other Rly.Dmd.Qty.: 0.00

Total Yearly Requirement:

244.86 Net Bal.Reqmt:

0.00

Position of Covered Dues after: 01/01/2012

PO Number	Date	PO Type	Orig.D.P	Extnd.D.P	Rate/Unit	Landed Rate	Order Qty.	RO Qty.	O/S Qty.	Status
1 025130291.T1320371	13/12/13	REG	30/05/14	30/08/14	848.00	848.00	137.00	135.30	1.70	ORDER COMPLETED
RM0004 RAIL TECH NEW DELHI Qty.U/Rcpt.:0 Acpt Qty : 0 Qty.Rej: 0 Pkg.:PI002										
Drg.: IS 2501-LATEST & IS:191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)										
From	To	Qty. to deliver	Qty. Delivered							
01/03/14	30/08/14	137.00	135.30	20/8/14 ✓						
Demand Covered: 21400448										
2 025130291.T1320303	05/12/13	REG	30/06/14	30/06/14	808.00	848.40	254.00	254.20	-0.20	ORDER COMPLETED
J13529 JAIN AGENCIES NEW DELHI Qty.U/Rcpt.:0 Acpt Qty : 0 Qty.Rej: 0 Pkg.:PI002										
Drg.: IS 2501-LATEST & IS:191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)										
From	To	Qty. to deliver	Qty. Delivered							
01/03/14	30/06/14	254.00	254.20							
Demand Covered: 21400448										
3 028120698.T1220135	05/10/12	REG	30/03/13	30/03/13	835.00	876.75	270.00	258.30	11.70	ORDER COMPLETED
RM0004 RAIL TECH NEW DELHI Qty.U/Rcpt.:0 Acpt Qty : 0 Qty.Rej: 0 Pkg.:PI002										
Drg.: IS 2501-LATEST & IS:191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)										
From	To	Qty. to deliver	Qty. Delivered							
01/01/13	30/03/13	270.00	258.30	30/3/13 ✓						
Demand Covered: 21202221										
4 02X110929.T1220006	09/04/12	REG	31/07/12	31/07/12	798.89	798.89	340.00	340.00	0.00	ORDER COMPLETED
RM0004 RAIL TECH NEW DELHI Qty.U/Rcpt.:0 Acpt Qty : 0 Qty.Rej: 0 Pkg.:PI002										
Drg.: IS 2501-LATEST & IS:191-LATEST (MINIMUM ACCEPTABLE LENGTH 4.1METRE)										
From	To	Qty. to deliver	Qty. Delivered							
09/04/12	31/07/12	340.00	340.00	30/6/12 ✓						
Demand Covered: 21200231										
Total Outstanding Quantity: 0.00										

Details of Demands :

Year	Demand Number	Date	Demand Qty.	Unit	Case No.	Tender No.	Due On	Tend Qty	Status
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- PO completion report for the said PO was also obtained to get the receipt date of the material

RAIL COACH FACTORY, KAPURTHALA M/S Rail Tech.

PO Completion Report Item : AL Conduit

No. : T1240045
Date: 20 Jan-2015

COS
Rail Coach Factory,
Kapurthala

Subject:- Completion Report of PO No. T1240045 Date: 27-AUG-12
Orig. DP : 30-NOV-12 Extnd DP : 30-NOV-12 Value of PO(Rs) : 948129
placed on M/S RAIL TECH NEW DELHI

Reference:-

Details of supplies made by the firm against above said purchase order are under :-

PL No. : 23983100	Rate : 151	Unit : 22	Ord Qty : 5980					
Description : AL CONDUIT 40MM THREADABLE QUALITY DESIGNATION-63400WP 2.5MM THICK								
Drawing No. : IS:1285-2002,SUITABLE FOR ELECTRICAL DIMENSIONS CONFIRMING TO IS:9537-81								
Challan No & Date	DRR Number & Date	DRR Qty Acptd Qty	Receipt date	Rnote No & Date	RO No & Date	RO Qty	RejMemoNo & Date	Rejected Qty
20	12164144-0	4600	05/09/12	12164411	031120670	4600		
05/09/12	06/09/12	4600		24/09/12	26/09/12			
36	12166232-0	1256.36	24/12/12	12166663	031120953	1256.36		
24/12/12	28/12/12	1256.36		16/01/13	17/01/13			
						5856.36		

DURING THE ABOVE MENTIONED PERIOD RAILWAY ADMINISTRATION HAS:

(Strike out which is not applicable)

1. Suffered no loss & no inconvenience.
2. Suffered no loss but inconvenience has been caused which can not be quantified in term or money.
3. Suffered following losses.....

Dy. Chief Material Manager Stores/Depo
Rail Coach Factory, Kapurthala

The following cases illustrate the method of calculating vendor rating from given data.

CASE 1:

Vendor: Gaurav Associates

PL no. : 33690145

No. of PO : 3

QR – 100 DR – 69 Supplier rating : 87.6

S.No.	PO Date	Deivery period		Delivery date	Delay in delivery	Qty. to deliver	Qty. delivered
1	09/11/13	11/11/13	30/04/14	08/4/14	-	21	83
		01/5/14	31/10/14	-	-	62	0
		15/12/14	28/02/15	20/12/14	-	25	25
2	13/02/13	01/03/13	30/08/13	10/08/13	-	450	450
3	24/01/12	02/04/12	31/05/12	31/05/12	-	339	339
		01/06/12	30/08/12	29/12/12	121 days	339	329

$$QR = (1226/1226) * 100 = 100$$

$$DR = \{897 + 329(1 - 2 \times 121/219)\} * 100 / 1236 = 69$$

$$\text{Supplier rating} = 0.6 \times 100 + 0.4 \times 69 = 87.6$$

CASE 2:

Vendor: Competent Engineers PL no. : 33555795 No. of PO : 4

QR – 30.2 DR – 22.01

Supplier rating : 26.92

S.No.	PO Date	Deivery period		Delivery date	Delay in delivery	Qty. to deliver	Qty. delivered
1	28/03/14	01/04/14	26/12/14	-	-	94	0
2	03/07/13	03/07/13	07/11/13	29/11/13	22 days	42	42
3	03/08/12	03/08/12	30/11/12	-	-	33	0
4	29/05/12	01/06/12	31/07/12	07/06/12	-	13	13

$$QR = 55/182 * 100 = 30.2$$

$$DR = \{13 + 42(1 - 2 \times 22/127)\} / 182 = 22.01$$

$$\text{Supplier rating} = 0.6 \times 30.2 + 0.4 \times 22.01 = 26.92$$

Drawbacks of IR vendor rating:

- Covers only two parameters for vendor rating – Quality and delivery.
- Doesn't take into account the service factor which includes communication by the vendor, deviation from conditions, submission of documents, after sale service etc.
- Number of samples rejected by RITES is not being taken into account as of now for calculation of quality rating.

Drawbacks of IR vendor rating (contd.) :

- There is no provision to provide vendor rating for new vendors.
- Although RCF has developed a fairly good system for calculating vendor rating, it has not implemented the same for screening the vendors since vendors with very low ratings are being awarded tenders as of now.

Taguchi Loss Function

Taguchi Loss Function

- It is used for measuring loss to society due to non-conformance.
- It is probably the most widely accepted technique for quantifying loss in engineering and science experimentation.
- The Taguchi loss function defines specification limits beyond which product is not accepted and loss is 100% to society.

Taguchi Loss Function

- We can define target values of loss due to non conformity of supplier to our requirement.

$$L(y) = k(y - m)^2 \quad (1)$$

- $L(y)$ is the loss associated with a particular value of quality character y , m is the nominal value of the specification, k is the loss coefficient

Taguchi Loss Function

- *Smaller is better* $L(y) = k(y)^2$ (2)
- *Higher is better* $L(y) = k/y^2$ (3)

$L(y)$, y and k have the same meanings as in Eq. 1.

What is y ?

What formulae to use?

Taguchi Loss Function

Character	Corresponding Loss	y	Formulae used
Quality	LQ	% of material rejected	Ky^2
Delivery	LD	Delay in delivery in days	Ky^2
Price	LP	% of quoted rate above L1	Ky^2
Service	LS	Compliance and Responsiveness	K/y^2

Taguchi Loss Function

Target value of criteria and weightage

Criteria	Target Value	Range	Specification Limit	weightage
Quality	0%	0-5%	5%	50%
Delivery	0	0-15	15 Days	20%
Price	Lowest	0-10%	10% Higher	20%
Service	100%	50-100%	50% Lower	10%

$$\text{Loss} = 0.5 \times \text{LQ} + 0.2 \times \text{LD} + 0.2 \times \text{LP} + 0.1 \times \text{LS}$$

Taguchi Loss Function

Calculation of Taguchi loss coefficient

Criteria	Taguchi Function	Specification Limit	Loss(assuming 100% loss at specification limit)	Value of K
Quality	Ky^2	5% rejection	$100 = k \times (0.05)^2$	40000
Delivery	Ky^2	15 Days	$100 = k \times (15)^2$	0.4444
Price	Ky^2	10% higher	$100 = k \times (0.10)^2$	10000
Service	K/y^2	50% lower	$100 = k / (0.50)^2$	25

Taguchi Loss Function

Calculation of Taguchi loss coefficient

Loss due to	Quality LQ	Delivery LD	Price LP	Service LS
Value of Taguchi constant (k)	40000	0.4444	10000	25
Loss	$Kx(\text{value})^2$	$Kx(\text{value})^2$	$Kx(\text{value})^2$	$K/(\text{value})^2$
Weight	0.5	0.2	0.2	0.1
Total Loss due to Supplier	$0.5xLQ + 0.2xLD + 0.2xLP + 0.1xLS$			

Data Collection from SWR and Methodology

- Tender Case and past 3 PO.

Taguchi Loss Function

Case Study on Taguchi Loss Function (Data Collection from SWR)

- Rates offered by different vendors in tendor Number-77141018

Firm	Rates	Status	Deviation
Vibgyor paints & chemical, Pudducherry	98.75	L1	No deviation
Vibgyor paints & chemical, Chennai	103.05	L2	No deviation
GS Industries, Jalandhar	110	L3	deviation
Anupam Enterprises, Kolkata	110.28	L4	deviation
Puskar Paint Industries, Lucknow	200.73	L5	deviation

Taguchi Loss Function

Data analysis and loss calculation of Anupam Enterprise, Kolkata

1st Purchase Order

- Deviation in delivery terms
- Complete Quantity cancelled

Loss due to →	Quality LQ	Delivery LD	Price LP	Service LS
Value of Taguchi constant, k	40000	0.4444	10000	25
Loss	100	100	100	75
Weight	0.50	0.20	0.20	0.10
Total loss due to Supplier	97.5			

Taguchi Loss Function

Data analysis and loss calculation of Anupam Enterprise, Kolkata

2nd Purchase Order
• Deviation in delivery terms

Loss due to →	Quality LQ	Delivery LD	Price LP	Service LS
Value of Taguchi constant, k	40000	0.4444	10000	25
Loss	0	0	100	75
Weight	0.50	0.20	0.20	0.10
Total loss due to Supplier	27.5			

Taguchi Loss Function

Data analysis and loss calculation of Anupam Enterprise, Kolkata

3rd Purchase Order

- Deviation in delivery terms
- DP extended

Loss due to →	Quality LQ	Delivery LD	Price LP	Service LS
Value of Taguchi constant, k	40000	0.4444	10000	25
Loss	0	100	100	75
Weight	0.50	0.20	0.20	0.10
Total loss due to Supplier	47.5			

Taguchi Loss Function

Data analysis and loss calculation of Anupam
Enterprise, Kolkata

PO	Loss in %	Weigtage based on value	Total Loss Value in %
1	97.5	0.345	60.24
2	27.5	0.2242	
3	47.5	0.4	

Taguchi Loss Function

New Comparative after analysis

Firm	Rates	Status	Loss in %
Vibgyor paints & chemical, Pudducherry	98.75	L1	40.79
Vibgyor paints & chemical, Chennai	103.05	L2	30.24
GS Industries, Jalandhar	110	L3	49.28
Anupam Enterprises, Kolkata	110.28	L4	60.24
Puskar Paint Industries, Lucknow	200.73	L5	54.57

**BHEL- Bharat Heavy Electricals
Limited
Supplier Performance Rating (SPR)**

About BHEL

- **Bharat Heavy Electricals Limited (BHEL)** is a Public Sector Enterprise manufacturing integrated power plant .
- BHEL was established in 1964, ushering in the indigenous Heavy Electrical Equipment industry in India.
- It is engaged in the design, engineering, manufacture, construction, testing, commissioning and servicing of a wide range of products.
- It has 15 manufacturing divisions, and currently operates at more than 150 project sites across India and abroad.
- It is the 7th largest power equipment manufacturer in the world. It has a workforce of about 50,000.

Supplier Performance Rating (SPR):

- BHEL has a scientific method of Supplier Performance monitoring and rating system.
- Supplier performance is assessed with respect to the following main factors and it is calculated for each consignment/ purchase order:

Supplier Performance Rating (SPR)

Rating	Weightage
Quality	60
Delivery	30
Service	10
Total	100

Quality Rating

Quality Rating (QR) is given 60% weightage.

Quality rating is based on acceptable quantity of material offered for inspection or delivered by supplier

$$QR = \frac{(Q1 + 0.75 \times Q2 + 0 \times Q3) \times 60}{Q}$$

where, Q =Quantity inspected

Q1 =Quantity accepted

Q2 =Quantity accepted with concession / deviation/
rectification

Q3 =Quantity rejected

The pre-inspection report (at supplier's works) includes the quantity accepted after rework in Q2 category.

Delivery Rating

- **Delivery Rating (DR) is given 30% weightage**
- Supplier is rated on delivery parameters as follows.
- Adherence to P.O delivery date = 30
- One mark is deducted for each day's delay.

Service Rating

- **Service Rating (SR) is given 10% weightage**
- Service Rating is given on the basis of the following criteria

	SR
Cooperation and readiness to help in emergency, submission of Support documents such as GA Drawings, TC,GC etc. as applicable, submission of final technical documents, O&M Manuals and as built drawings complete and in time.	5
Promptness in reply/attending quality problems at site/shop	5

- Thus, the Supplier Performance Rating (SPR) = $QR + DR + SR$
- The period for calculation of SPR is previous year plus elapsed period of current year or period for last three executed purchase orders whichever is more.

- There is a system of FEEDBACK FROM SHOP FLOOR at BHEL. If nonconformance/defects in components are noted while processing at shop floor overall performance rating will be multiplied by demerit factor (DF). The demerit factor is calculated in the following manner:

	DF
Components used after rectification	0.9
Components replaced by supplier	0.8
Supplier does not rectify/ replace/respond	0.0

Case Study – Case 1

Gaurav Associates

- **Quality Rating (QR)**
- $QR = \frac{(Q1 + 0.75 \times Q2 + 0 \times Q3) \times 60}{Q}$

PO Date	Quantity Inspected	Quantity accepted	Quantity Accepted with concession	Quantity Rejected	QR
09/11/2013	108	108	-	-	60
13/02/2013	450	450	-	-	60
24/01/2012	668	668	-	-	60

$$\begin{aligned} \text{QR (average)} &= (60+60+60)/3 \\ &= 60 \end{aligned}$$

Delivery Rating (DR) is given 30% weightage

- Adherence to P.O delivery date = 30
- One mark is deducted for each day's delay.

S.No.	PO Date	Delivery period		Delivery date	Delay in delivery	Delivery Rating
1	09/11/13	11/11/13	30/04/14	08/4/14	-	30
		01/5/14	31/10/14	-	-	
		15/12/14	28/02/15	20/12/14	-	30
2	13/02/13	01/03/13	30/08/13	10/08/13	-	30
3	24/01/12	02/04/12	31/05/12	31/05/12	-	30
		01/06/12	30/08/12	29/12/12	121 days	0

$$\begin{aligned}
 \text{SR} &= (30+30+30+30+0)/5 \\
 &= 24
 \end{aligned}$$

Service Rating (SR) is given 10% weightage

- Service Rating is given on the basis of the following criteria.

	SR
Cooperation and readiness to help in emergency, submission of Support documents such as GA Drawings, TC,GC etc. as applicable, submission of final technical documents, O&M Manuals and as built drawings complete and in time.	3
Promptness in reply/attending quality problems at site/shop	4

Thus, the Supplier Performance Rating (SPR) = QR+DR+SR

$$\begin{aligned}\text{Overall Rating} &= 60+24+3+4 \\ &= 90\%\end{aligned}$$

Case Study – Case 1

Competent Engineers

- **Quality Rating (QR)**

PO Date	Quantity Ordered	Quantity accepted	Quantity Accepted with concession	Quantity Rejected	QR
28/03/2014	94	0	-	-	0
03/07/2013	42	42	-	-	60
03/08/2012	33	0	-	-	0
29/05/2012	13	13	-	-	60

$$\begin{aligned}\text{QR (average)} &= (0+60+60+0)/4 \\ &= 30\end{aligned}$$

Delivery Rating (DR) is given 30% weightage

- Adherence to P.O delivery date = 30
- One mark is deducted for each day's delay.

S.No.	PO Date	Delivery period		Delivery date	Delay in delivery	Service Rating
1	28/03/14	01/04/14	26/12/14	-	-	0
2	03/07/13	03/07/13	07/11/13	29/11/13	22 days	8
3	03/08/12	03/08/12	30/11/12	-	-	0
4	29/05/12	01/06/12	31/07/12	07/06/12	-	30

$$\begin{aligned} \text{SR} &= (8+0+30)/4 \\ &= 9.5 \end{aligned}$$

Service Rating (SR) is given 10% weightage

- Service Rating is given on the basis of the following criteria.

	SR
Cooperation and readiness to help in emergency, submission of Support documents such as GA Drawings, TC,GC etc. as applicable, submission of final technical documents, O&M Manuals and as built drawings complete and in time.	1
Promptness in reply/attending quality problems at site/shop	0

Thus, the Supplier Performance Rating (SPR) = QR+DR+SR

$$\begin{aligned}\text{Overall Rating} &= 30+9.5+1+0 \\ &= 40.5\%\end{aligned}$$

Vendor	Railway Formula	BHEL Formula
Gaurav Associates	87.6	90
Competent Engineers	26.92	40.5

Conclusion and Recommendations

- Vendor evaluation is important as it can reduce supply chain costs but one model cannot be a best option in all the situations.
- Balance of objectivity and subjectivity should be a focus for any model.
- As per our studies Taguchi applies well to our cases, have yielded best result among other options.
- But again the applicability of any method cannot be sacrosanct and needs to be first analyzed objectively. Taguchi may be applied to almost every situation but careful tweaks and variations are to be done as per requirement in some weightages.
- Sample test data for inspection done by RITES should be incorporated in MMIS.
- Also the non stock data from different users needs to be captured.
- Pilot projects may be implemented in PUs.
- Zonal railways should incorporate data with MMIS.

THANK YOU