International Journal of Current Research and Review
DOI: 10.7324/IJCRR.2017.9243

Review Article

IJCRR
Section: General Science
Sci. Journal Impact Factor 4.016
ICV: 71.54

Statistical Modelling for Job Satisfaction of Maharashtra State Road Transport Corporation Key Members

Avinash S. Jagtap[1], Nilambari A. Jagtap[2], Pooja S. Zanjurne[3]

[1,2,3]Department of Statistics, Tuljaram Chaturchand College, Baramati, Dist. Pune (MS), India.

ABSTRACT

Mobility is one of the characteristics of human beings; movement is the feature of human nature which simply means mere movement of persons from one place to another for getting comfort journey. Bus conductors and Drivers of MSRTC are serving to society. Moreover they can be considered as face of MSRTC as they are having direct contact with passengers. In this paper we study various factors affecting on the job satisfaction of conductors and drivers. Bus conductors and drivers are randomly selected as a sample. Their job satisfaction is analyzed through structured questionnaire. The first part of the questionnaire is focused on the personal information like age, education, number of family members, earning members etc. and second part is focused on the official information of the respondents like number of charge sheet, presentism and abstentism. The statistical analysis is done by using the statistical tools like Chi square test, linear discriminant analysis, multiple logistic regression. It is clear from this study that the working environmental factor affects the job satisfaction. The accuracy of fitted model is 67%. Linear Discriminant model has 96% accuracy.

Key Words: Job satisfaction, Health problem, Stepwise regression

INTRODUCTION

Traffic staff is one of the important factors for operating functions. Traffic staff includes drivers, conductors, traffic controllers, line checking staff, traffic inspectors and other traffic staff. The drivers and conductors are appointed with their services based on the sanctioned schedules, their work norms are set according to the provisions of Motor Transport Workers Act 1961 (MTW Act) which prescribes a daily steering duty of 8 hours and spread over duty of 12 hours.

Maharashtra State Road Transport Corporation(MSRTC) is a leading passenger road transport organization in India having fleet of over 18,000 buses and operating over 1,05,000 bus trips daily covering 58 lacks of Kms. MSRTC is aimed to provide punctual, safe, comfortable and economical services to the passengers. It spread in all over Maharashtra nearly 88% villages. MSRTC not only working in the area of providing transport facility to passengers but also it provide service carriage of parcels currier and Allied material by using the carriage of buses with consideration of given information MSRTC obviously need competent, motivated, trained ,satisfied and alert Human Resource for running one of the biggest public transport organizations of India. The following are two personnel who constitute the subject matter of study. As we know the conductors and drivers are Crew members (Conductors and Drivers) of MSRTC.

A bus conductor has to deal with thousands of passengers every day. Buses are two most important forms of public transport the other being trains. The burden of dealing with increasing number of commuters is very heavy. He has to behave well with the passenger and see to it that everyone is issued a right ticket, and thus increase passenger satisfaction, and in the process earn maximum revenue for the organization.

Job satisfaction is most important thing in any job. If the key members satisfy with their job then it tends to high quality of work they do. But they do not satisfy with their job it may be a serious issue because the key members have direct contact with public so that if they are unsatisfied with their job their behaviour is rood about passenger and this is one kind of the

Corresponding Author:
Avinash S. Jagtap, 1Department of Statistics, Tuljaram Chaturchand College, Baramati, Dist. Pune (MS), India.
Contact No.: 9822992210; E-mail: avinash.jagtap65@gmail.com

ISSN: 2231-2196 (Print) **ISSN:** 0975-5241 (Online)
Received: 23.11.2017 **Revised:** 02.12.2017 **Accepted:** 11.12.2017

loss to MSRTC so that the checking crew member satisfaction with their job is important thing. With the help of this paper we will find which factor are strongly affecting on job satisfaction of key members. Also we find the association between variables.

MATERIAL AND METHODS

The present study is undertaken on the employees (Drivers and conductors) of selected MIDC ST Depot, Baramati, Dist. Pune of MSRTC. The study is mainly based on primary data collected from the respondent the drivers, conductors, driver cum conductors of MSRTC by way of structured questionnaire, to be precise, pre-coded. This interview schedule has been organised in two parts. The first part of the questionnaire is focused on the personal information like Age, Education, No. of family Members, Earning Members etc. and second part is focused on the official information of the respondents like number of charge sheet, presentism and abstentism. Here we use the variable like Ts/TTS/DW is the permanent, temporary, and contract basis.

Multiple logistic regression: This is one type of generalized linear model (GLM). Multiple Logistic Regression is used when response variable is binary. It is utilized for predicting the outcome of a categorical variable based on one or more independent variables. Specific form of logistic regression model

$$\Pi(x)=\exp^{(g(x))}/[1+\exp^{g(x)}]$$

Generalized linear model: In a GLM the response variable distribution must only be a member of the exponential family which includes the normal, Poisson, binomial, exponential and gamma distribution as members. Distribution that the members of the exponential family have the general form

$$g(x)=\beta_0+\beta_1X_1+\ldots\ldots\ldots\ldots+\beta_pX_p$$

We are interested in determining the future event, our response is binary for that purpose we use the GLM after getting the significant variable from cluster analysis we able to fit generalized linear model for our data. From the fitted model we can predict the future event.

Stepwise regression: Stepwise regression includes regression models in which the choice of predictive variables is carried out by an automatic procedure. Forward Selection**,** which involves starting with no variables in the model, testing the addition of each variable using a chosen model comparison criterion, adding the variable (if any) that improves the model the most and repeating this process until none improves the model. AIC –Akien's Information Criteria: The general for calculating AIC is

$$AIC= -2*\ln(\text{likelihood}) +2*k$$

AIC can also be calculated using residual sum of squares from regression,

$$AIC=n*\ln(RSS/n) +2*k$$

Where, n is the number of data points, RSS is the residual sum of squares, AIC requires a bias-adjustment small sample size. From the stepwise regression we get the significant variables for regression models for our data. The model which has smallest value of AIC as compare to the other models it gives the best regression model for our data.

Confusion Matrix: A Confusion Matrix is a visual performance assessment of a classification algorithm in the form of a table layout or matrix. Each column of the matrix represents predicted classifications and each row represents actual defined classifications. This representation is a useful way to help evaluate a classifier model. A well behaved model should produce a balanced matrix and have consisted percent correctness numbers for accuracy, recall, precision and F measure. Accuracy= (True positive + false positive)/ (total)

Precision=True positives / (true positives + false positives).

To determine the accuracy of the fitted model we use the confusion matrix for the response variable.

Linear Discriminant Analysis(LDA): Linear Discriminant analysis and the related fisher's linear discriminant are methods used in statistics, pattern reorganization and machine learning to find a linear combination of features which characterizes or separate two or more class of objects or events. LDA is a closely related to analysis of variance and regression analysis, which also attempt to express one dependent variable as a linear combination of other features or measurements.

Data Analysis: The analysis includes chi-square test of independence to examine the nature of relationship between variables. The collected data will be analysed by using Multiple Logistic Regression Analysis.

Abbreviations : Faci: Facilities, San: Sanitary, Clean : Cleanness, Spac: Space, Rest : Rest house facility, Guest: Guest house facility, df : Degrees of freedom, Dist :Distance, SY: Service years, Pay: Payment, EM: Earning members , HP: Health problem, Ts: Time skill, famliym: Family members, JS : Job satisfaction, TPM : Transition probability matrix.

Association between job satisfaction and various environmental factors

	Chi-squre	df	P-value
Faci	1.5245	1	0.2169
San	1.5245	1	0.2169
Clean	10.0701	1	**0.001507**
Spac	9.6093	1	**0.001936**
Rest	1.0712	1	0.3007
Guest	0.733	1	0.3919

Logistic regression

Model 1:

The regression equation is,

Job satisfaction ~Age+Space+Distance+Serviceyears+ Payment+Earningmembers+Healthproblem+Timeskill+ status+Guest house

Start: AIC=130.5

Coefficients:

(Intercept)	Age	spac	Dist
-1.169e+00	2.422e-02	1.408e+00	1.175e-03
SY	familym	Pay	EM
-4.508e-02	-1.361e-02	3.914e-05	3.110e-01
HP	Ts	status	Guest
-9.731e-01	-5.486e-01	-7.272e-01	4.700e-01

Degrees of Freedom: 91 Total (i.e. Null); 80 Residual

Null Deviance: 126

Residual Deviance: 106.5 AIC: 130.5

>summary(model)

Call:

glm(formula = JS ~ Age + spac + Dist + SY + familym + Pay + EM + HP + Ts + status + Guest, family = "binomial", data = mydata)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.0605	-0.8725	-0.5015	0.9859	1.9934

Predictor	Estimate	Std.Error	Z value	P(>|z|)
Intercept	-1.17E+00	1.89E+00	-0.62	0.53552
Age	2.42E-02	5.33E-02	0.454	0.6495
space	1.41E+00	5.04E-01	2.796	0.00517
Dist	1.18E-03	2.15E-03	0.547	0.58447
Sy	-4.81E-02	5.66E-02	-0.797	0.42557
familym	-1.36E-02	1.45E-01	-0.094	0.92505
Pay	3.91E-05	7.60E-05	0.515	0.6064
EM	3.11E-01	3.61E-01	0.861	0.38924
HP	-9.73E-01	7.02E-01	-1.013	0.31099
status	-7.27E-01	1.13E+00	-0.643	0.52005
Guest	4.70E-01	5.36E-01	0.878	0.38009
Ts	-5.49E-01	5.42E-01	-1.013	0.31099

Model 2:

> X=step(model)
Start: AIC=130.46

JS ~ Age + spac + Dist + SY + familym + Pay + EM + HP + Ts + status + Guest

Predictor	df	Deviance	AIC
Age	1	106.67	126.67
Pay	1	106.75	126.75
Dist	1	106.8	126.8
status	1	106.91	126.91
Sy	1	107.2	127.2
Guest	1	107.24	127.24
EM	1	107.26	127.26
Ts	1	107.59	127.58
HP	1	108.51	128.51
Spac	1	114.94	134.94

Model 3:

Step: AIC=126.67

JS ~ spac + Dist + SY + Pay + EM + HP + Ts + status + Guest

Predictor	df	Deviance	AIC
status	1	106.96	124.96
Dist	1	107.07	125.07
Sy	1	107.23	125.23
Pay	1	107.38	125.38
EM	1	107.4	125.4
Guest	1	107.48	125.48
Ts	1	107.81	125.81
HP	1	108.59	126.59
Spac	1	115.01	133.01

Model 4:

Step: AIC=124.96
JS ~ spac + Dist + SY + Pay + EM + HP + Ts + Guest

Predictor	df	Deviance	AIIC
Dist	1	107.37	123.37
Sy	1	107.53	123.53
Pay	1	107.61	123.61
Guest	1	107.64	123.64
EM	1	107.78	123.78
Ts	1	108.24	124.24
HP	1	109	125
Spac	1	115.34	131.34

Model 5:

Step: AIC=123.37

JS ~ spac + SY + Pay + EM + HP + Ts + Guest

Predictor	df	Deviance	AIC
Pay	1	107.93	121.93
Sy	1	107.97	121.97
EM	1	108.04	122.04
Guest	1	108.27	122.27
Ts	1	108.87	122.87
HP	1	109.32	123.32
Spac	1	116.42	130.42

Model 6:

Step: AIC=121.93

JS ~ spac + SY + EM + HP + Ts + Guest

Predictor	df	Deviance	AIC
Sy	1	108.01	120.01
EM	1	108.42	120.42
Guest	1	108.82	120.82
HP	1	109.78	121.78
Ts	1	110.35	122.35
Spac	1	118.48	130.48

Model 7:

Step: AIC=120.01

JS ~ spac + EM + HP + Ts + Guest

Predictor	df	Deviance	AIC
EM	1	108.56	118.56
Guest	1	108.84	118.84
HP	1	110.26	120.26
Ts	1	110.36	120.36
Spac	1	118.57	128.57

Model 8:

Step: AIC=118.56

JS ~ spac + HP + Ts + Guest

Predictor	df	Deviance	AIC
Guuest	1	109.48	117.48
HP	1	111.14	119.14
Ts	1	111.47	119.47
Spac	1	119.67	127.67

Model 9:

JS ~ spac + HP + Ts

Deviance Residuals:

Min	1Q	Median	3Q	Max
-1.4745	-0.8385	-0.5272	0.9069	2.0210

Degrees of Freedom: 91 Total (i.e. Null); 88 Residual

Null Deviance: 126

Residual Deviance: 109.5 AIC: 117.5

Pridictor	Estimate	Std.Error	Zvalue	Pr(>|Z|)
Intercept	-0.08131	0.65692	-0.124	0.9015
Spac	1.5404	0.47891	3.216	0.0013
HP	-1.0388	0.65307	-1.591	0.1117
Ts	-0.78322	0.49801	-1.573	0.1158

Test statistics: Residual deviance=109.46

Table value $=\chi^2_{87,0.05} = 109.7733$

Here, $\chi^2_{87,0.05}$ >Residual deviance

Confusion matrix:

	Unsatisfied	Satisfied
FALSE	38	16
TRUE	14	24

>accuracy=((38+24)/92)*100;accuracy

[1] 67.3913%

>sensitivity=(24/38)*100;sensitivity

[1] 63.15789%

>specificity=(38/54)*100;specificity

[1] 70.37037%

precision=24/(24+16)*100

[1] 60%

Stochastic analysis for job satisfaction:

> TPM=matrix(c(32/58,26/58,16/34,18/34),nrow=2);TPM

	[,1]	[,2]
[1,]	0.5517241	0.4705882
[2,]	0.4482759	0.5294118

State 1: Person is not satisfied with their job.

State 2: Person is satisfied with their job.

tpm10=tpm9%*%TPM;tpm10

[,1] [,2]

[1,] 0.5 0.5

[2,] 0.4878587 0.4878587

Discriminant analysis:

Assumptions of discriminant analysis are Predictors are multivariate normally distributed and there is homogeneity in predictors.

F test to check homogeneity

Ho: $\sigma_1^2 = \sigma_2^2$ VS. H1:$\sigma_1^2 \neq \sigma_2^2$

abst=scan("clipboard")

leav=scan("clipboard")

>var.test(abst,leav,alternative="two.sided")

F test to compare two variances

data: abst and leav

F = 1.167, numdf = 91, denomdf = 91, p-value = 0.4628

alternative hypothesis: true ratio of variances is not equal to 1

95 percent confidence interval:

0.7717766 1.7646473

sample estimates:

ratio of variances

1.167010

Decision: p-value = 0.4628>0.05

Hence we proceed to discriminant analysis.

Discriminant analysis:

>data=read.table("C:/Users/ACS/Desktop/123.txt",header=T)

>library(MASS)

>lda=lda(Charge~.,data=data)

lda(Charge ~ ., data = data)

Prior probabilities of groups:

0	1
0.967391	0.032608

Group means:

	abst	Leav
0	0.782772	1.689139
1	1.888889	3.666667

Coefficients of linear discriminants:

	LD1
abst	0.222341
leav	0.401899

>lda.pred=predict(lda,data=data)

>ldaclass=lda.pred$class

>table(ldaclass,data$Charge) # to find confusion matrix

	0	1
0	88	3
1	1	0

>accuracy=(88/92)*100;accuracy 95.65217%

DISCUSSION

The key members has on an average 39 age and Rs.14440/- payment. They have almost 6 members in family and out of which on an average 1.435 are earning members. The key members have almost 70.88 Km distance from working place to native place. They have on an average 11 years of service, that means in this depot almost all key members are recently joined. They take almost 1 absentee per month. They take on an average nearly 2 leaves per month. The p –value of the variable Space is less than 0.05. From the TPM we can say that, the probability of person is not satisfied at current stage and he will be not satisfied after 10 years is 0.5. The probability of person is not satisfied at current stage and he will be satisfied after 10 years is 0.5. The probability of person is satisfied at current stage and he will be not satisfied after 10 years is 0.4878587. There is less probability of getting charge sheet to the employee.

CONCLUSION

The variables Age and Payment, Age and service year, Payment and service year, service year and payment are dependent on each other. The job satisfaction is depends on factors Cleanness and space availability. The probability of person is satisfied at current stage and he will be satisfied after 10 years is 0.4878587. The accuracy of fitted model is 67%. Linear Discriminant model has 96% accuracy. Leaves are more significant compare to absentees. Variable space is significant.

REFERENCES

1. Andries du Plessis, Andrew Hobbs, Rebecca Marshall and Sherrol Paalvast, Human Resource Functions and Activities In The 21st Century To Attain Competitive Advantage, International Review of Business Research Papers, 2008, Vol. 4 No.3 Pp- 35-44.

2. Gurav A.M. and Pralhad Krishna Mudalkar, A circle study of Human resource Practices in selected Sugar Factories /Journal-The lUP Joumal of Management Research, 2011, Vol. 10, No. 1. Page No.46-78.
3. Ashok Som , Innovative human resource management and corporate performance in the context of economic liberalization in India / journal The International Journal of Human Resource Management., 2008, Vol. 19. No. 7, 1278-1297.
4. Basraj Benni, Aniardeep. Jadhav, Bus transport Efficiency Measurement with Reference to MSRT ('Sus depots of Kolhapur division" 2012.
5. Carlos Sanchez- Runde, Richard Whittington, Javier quarilha, Human Resource Management implications of New Forms of Organizing., 2000.
6. Chatterjee, S. R. Human Resource Management in India: Where From' and Where To?', Research and Practice in Human Resource Management, 2007, 15(2), 92-103.
7. Minbaeva, Dana B., HRM practices and MNC knowledge transfer /journal Personnel Review, 2005, Vol. 34 No. 1, pp. 125-144
8. Edel Conway, John McMackin, Developing a Culture for Innovation: What is the Role of the HR System?, DCU Business School Research Paper Series, 1997 Paper No 32, ISSN 1393-290X.
9. Mane Kiran Harish Chndra, A study of job satisfaction of Employees of Maharashtra state Road Transport Corporation (MSRTC) -A Field Study / Journal-Research Analysis and Evaluation, 2010, Vol. 1, Issue. 10. Page No.21 -23
10. Siiniannarayana M. Measuring Training and Development/ Journal - The Indian journal of industrial Relations, 2011, Vol.47, No. I Page No. 117-125.
11. Mir Mohammed Nurul Absar, Recruitment & Selection practices in Manufacturing linen in Bangaladesh, Journal- the Indian journal of Industrial Relations, 2012, Vol-47. No-3. Page No. 436-449.
12. Manonnini M., Wage - Productivity Linkages in Indian Industries / Journal- The Indian journal of Industrial Relations. 2012, Vol-47,No-3. Page No. 450-458.

Table 1: Descriptive statistics

	Age	Payment	Family member	Earning member	Distance	Service year	absent	Leave
Min	22	4000	2	1	0	1	0	0
1st Qu.	32	9000	4.75	1	21.5	4.75	0	0.3333
Median	38	11500	6	1	35	7	0	1
Mean	38.87	14440	5.826	1.435	70.88	11.9	0.8225	1.754
3rd Qu	47	19000	7	2	55	18	0.3333	2.333
Max	58	35000	11	5	800	38	20	13

Table 2: Correlation Matrix

	Age	Pay	Familym	EM	Dist	SY	Charge	abst	Leave
Age	1	**0.8195**	-0.0336	-0.168	-0.043	**0.7725**	0.0025	-0.0219	0.1016
Pay	**0.8195**	1	-0.0989	-0.1422	-0.127	**0.804**	0.08228	-0.1605	0.1221
familym	-0.0336	-0.0989	1	0.3247	-0.0316	-0.04144	-0.0164	0.09917	-0.0779
EM	-0.168	-0.1422	0.3247	1	-0.073	-0.1238	0.1346	0.078	0.05319
Dist	-0.0432	-0.127	-0.0316	-0.073	1	-0.1341	-0.082	0.4622	0.02478
SY	**0.7725**	**0.804**	-0.04144	-0.1238	-0.1341	1	0.04115	-0.08765	0.1023
Charge	0.0025	0.08228	-0.01645	0.1346	-0.08204	0.0411	1	0.08	0.1548
Abst	-0.02194	-0.1605	0.09917	0.0782	0.4622	-0.08765	0.08019	1	-0.1156
leave	0.1016	0.1221	-0.07797	0.005319	0.024	0.1023	0.15488	-0.1156	1

Matrix plot is as follows

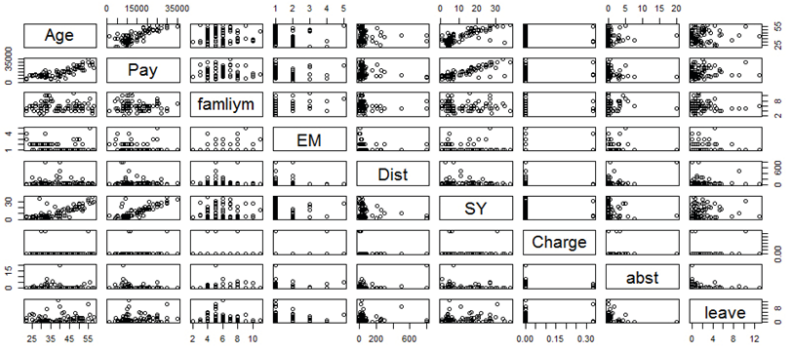

Figure 1: Matrix Plot.