Modelling the Impact of Demographic Variables on Employee Motivation Levels in Automobile Industry

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Abstract

Motivation of employees is one of the most critical components for an organization to be effective and efficient. Employee motivation is presented in the form of commitment, job satisfaction, high energy levels, willingness to take challenging assignments, and innovation while they are working for their organizations. It becomes very important for organizations to devise strategies and ways through which they can motivate and retain their employees. The present study is aimed to predict the motivation level of employees in automobile industry on the basis of their demographic variables using machine learning algorithms. The motivation level is measured by structured questionnaire with 70 items on the scale. The sample was collected from employees in automobile sector in Delhi/NCR region with a sample size of 340 employees. Analysis of the sampled data revealed that the machine learning algorithm is able to depict the motivation levels of employees on the basis of age, gender, and designation.

Keywords: Automobile industry, machine learning, motivation

I. INTRODUCTION

Are happy employees the most important employees within an organization? Who are happy employees and how organizations can build happy employees? These are the pertinent questions which every organization that wants to be successful is looking into. For any organization, employees are considered to be one of the most important assets as they add value in terms of profitability, competitive advantage, enhanced sales etc. Organizations require continuous efforts to make employees happy and committed, and the answer lies in employee motivation [1, 2].

Motivation is the inner state that drives a person to a goal directed behaviour. It is the intent or motive or drive to do some work in a specific direction. Employees work to satisfy their inner needs and there is some motive attached to it. Organizations use motives such as pay, rewards, recognition, promotion, appreciation, bonus, stock options, and many other forms of compensation [3, 5,7].

David [13] emphasized the importance of talent sourcing and retention in automobile industry as one of the major challenges in terms of war for talent 2.0. Organizations need to constantly think and innovate talent strategies in terms of challenging work environment, differentiation of talent, and cater to agile talent deployment in order to motivate and satisfy employees. With automation and radical shift of industry towards industry 4.0, there is high demand for skills like social intelligence, artificial intelligence, design thinking, virtual collaboration, computational design, and modelling. There is a deficit of skills and there is huge gap in terms of talent of employees. Therefore, it becomes more important for organizations to motivate and retain their highly skilled employees[18], [19], [20], [24].

Lot of research available on theories of motivation but very little research is focused on identifying the impact of demographic variables on motivation levels specifically, age and gender. It is claimed by many researchers that demographic variables including age, gender, education degree, and work tenure have the capacity to play a

significant role in assessing employee motivation and satisfaction levels in organizations [1], [14], [29], [15], [16], [17]. Therefore, the present study is based on predicting the effect of demographic variables like age, gender, and educational degree on the motivation level of employees in the automobile industry.

II. REVIEW OF LITERATURE

Cowherd and Levine [10] defined motivation into two categories as direction of behaviour, that is, to work towards achievement of goals and objectives, and strength of the behaviour, that is, how much effort an individual is putting in to reach goals. Motivation is further defined on the basis of equity theory as an unseen inner state that motivates a person's goal-directed behaviour. McShane [21] stated that motivation refers to three kind of forces within a person that affects the direction, amount of effort, and sustenance of voluntary behaviour. Stoner et al. pointed out that motivation is a mental characteristic that is related to a person's level of commitment which is further composed of factors like cause, channel, and enduring behaviour in a specific direction committed to organizational goals.

Motivation explains the relationship between employee's satisfaction and their performance, choices of factors related to drivers of employee behaviour for performance and reasons for sustained effort (Campbell and Pritchard, 1976).

Motivators such as need for power, need for achievement, and need for affiliation claim a central position for achievement and satisfaction of employees.

Nohria, Groysberg, and Lee [25] argued that employee motivation is one of the most influential tools to drive employees through both tangible and intangible factors, the need to be socially acceptable to others; understand and secure against external threats; and promote fairness, impacting people choices, and underlining everything they do.

III. DEMOGRAPHIC FACTORS AND EMPLOYEE MOTIVATION

Urosevic et al. (2016) conducted a research in the leather industry for identification of demographic variables on motivation and satisfaction. The study found a positive relation between age and level of motivation. Young people at the start of their career are motivated and satisfied with their work and later a decline in the level of motivation and satisfaction is observed.

Kukanja [23] analyzed a strong correlation between demographic variables and motivation. A different approach should be used to motivate people in different age groups, experience, education levels, and gender to achieve greater motivation levels. For example, money is a far more important factor for women as compared to men in organizations. Fun and flexible hours policy was found to be more useful for young people whereas, social security was found to be a more important motivator for elderly people.

In [6], the authors studied the association between demographic variables and motivational factors for social security hospitals in Mazandaran. A significant relationship was found between hire status, marital status, gender, age, tenure of service, and motivational factors. Henceforth, for better organizational effectiveness, motivation, and efficiency there is a need to cater to these differences in terms of demographic factors.

Qayyum and Sukirno [9] conducted an empirical study related to demographic factors and motivation in the banking industry. Age was found to be significantly impacted by motivational factors such as high salary, seniority-based promotion, and work life balance. Employees having differences in terms of job experience differed significantly from growth and development opportunities, learning and advancement opportunities, salary and promotion. Employees with differences on the basis of education varied from each other in terms of stable careers and learning opportunities. A significant difference was also noticed between male and female employees in terms of seniority based promotion [25][26].

IV. OBJECTIVES OF THE STUDY

1. To study the demographic factors affecting motivation of employees in the automobile sector.
2. To predict the motivation level of employees in the automobile sector.

V. RESEARCH METHODOLOGY

The present study is exploratory and analytical in nature as it is based on analyzing and predicting motivation level of employees in the automobile sector.

VI. DATA COLLECTION AND STATISTICAL TOOLS

A sample size of 340 respondents at different

designations was taken from various organizations of the automobile sector in Haryana. Data collection includes both primary and secondary sources of data collection. To analyze the motivation levels among employees, a structured questionnaire was used to collect data from employees in the automobile sector.

VII. RESEARCH INSTRUMENT

The scale used to measure motivation was developed by Srivastava [4]. The scale is further divided into seven sub-scales or dimensions of motivation. The subscales are as follows: need for personal growth, need for achievement, need for self-control, need for monetary gains, need for non-financial gains, need for social affiliations and conformity, and need for autonomy, and self-actualization.

There are a total of 70 response items or questions based on motivational dimensions as listed earlier with 10 questions each responding to one subscale. The scales range from 4 to 1 where:

4 : Always or highest range
3 : Mostly
2 : Seldom
1 : Never or lowest level

All the items on the scale are "true keyed" and rated on this four-point scale. Statistical tools like frequency distribution, mean, standard deviation, and Machine Learning algorithms on R 3.14 software were used to analyze and present data.

VIII. ANALYSIS

Discriminant Analysis technique predicts the probability of belonging to a particular class of an outcome variable (motivation). Since it works with both continuous and categorical predictor variables, initial analysis using motivation as a continuous variable was carried out and subsequently, analysis was done using motivation as a categorical variable.

Methodology

a) Loading requisite packages : Two packages **tidyverse** and **caret** are installed in the first step.
🕐 **Tidyverse** (data manipulation and visualization package)
🕐 **Caret** (contains machine learning overflow functions)

b) Dropping records with Missing Values

Na.omit() function was used to drop the missing values from the dataset.

c) Descriptive statistics

```
>head(data1)
    Designation Gender Age   MSCORE   Motivation
1        2        1     2     HIGH       236
2        2        1     2     MEDIUM     253
3        2        1     3     HIGH       244
4        2        1     3     HIGH       247
5        2        1     2     HIGH       248
6        2        1     3     HIGH       248
```

Using Dim() function to see the dimensions of the dataset.

```
>dim(data1)
[1] 313    5
```

Using str() function to view the structure of the dataset
```
>str(data1)
'data.frame':         313 obs. of  5 variables:
 $ Designation: int  2 2 2 2 2 2 2 2 1 1 ...
 $ Gender     : int  1 1 1 1 1 1 1 1 1 1 ...
 $ Age        : Factor w/ 5 levels ">55","1","2",..: 3 3 4 4 3 4 3 5 2 3 ...
 $ MSCORE     : Factor w/ 3 levels "HIGH","LOW","MEDIUM": 1 3 1 1 1 1 1 1 1 3 ...
 $ Motivation : int  236 253 244 247 248 248 234 240 235 185 ...
 - attr(*, "na.action")= 'omit' Named int  229 236
 ..- attr(*, "names")= chr  "229" "236"
```

d) Check for Normality

Preliminary tests were performed to check whether the assumption of normality is met.

(I) Visual Methods

1. Density plot is used to check normality visually. The outputs so obtained are given below:
The density plot shows that the given data falls under normal distribution.

2. A Q-Q plot (or quantile-quantile plot) is also plotted to draw the correlation between the given data set and normal
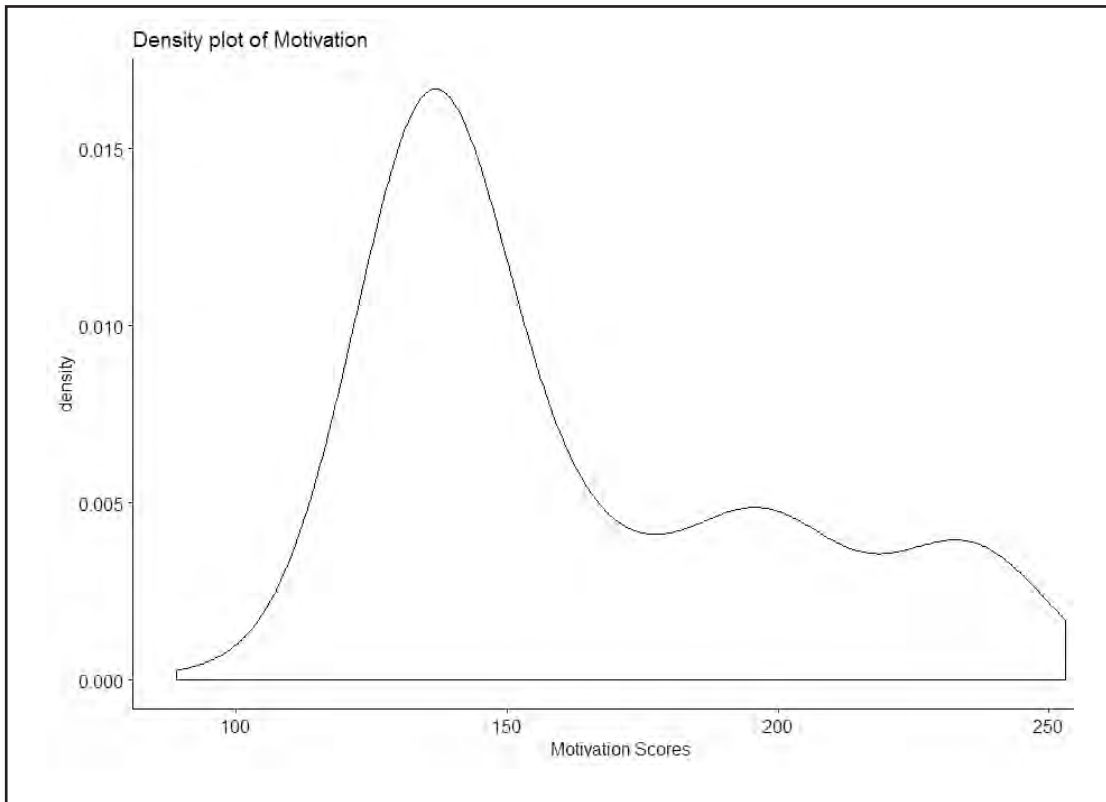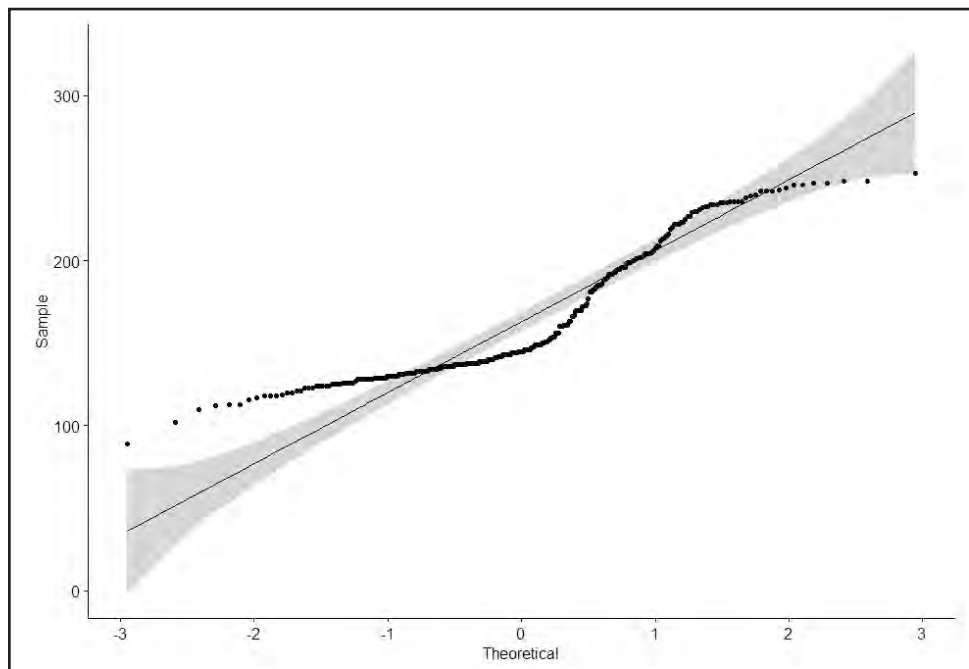
Fig. 1. Density Plot for Motivation

Fig. 2. QQ Plot

distribution. Also, a 45-degree reference line is plotted. The output of QQ plot is provided in Fig. 2.

Since all the points are appearing to fall along this reference line, normality can be assumed for the given data set.

3. Usually visual inspection is considered unreliable.

Hence, we deploy a significance test - **Shapiro-Wilk's** test which is used to compare the sample distribution to a normal distribution to determine that the given data does not deviate from normality. The Shapiro-Wilk's method is deployed to check for normality. The output of Shapiro Wilk's test is given below:

Shapiro-Wilk normality test
data: data1$Motivation
W = 0.87862, *p*-value = 5.001e-15

It can be seen from the output that the *p*-value is less than 0.05, which indicates that the normal distribution is not significantly different from the data. In other words, normality can be assumed.

e) Other Plots

The following box plots are plotted to identify to understand the relationship between three categorical values, designation, age, and gender with the outcome continuous variable *Motivation.*

f) Data Preparation

The motivation dataset obtained through Primary Data Collection technique is used for predicting the Motivation Score on the basis of three predictor variables – designation, age, and gender.

Step 1 : The data is divided into training and test set.

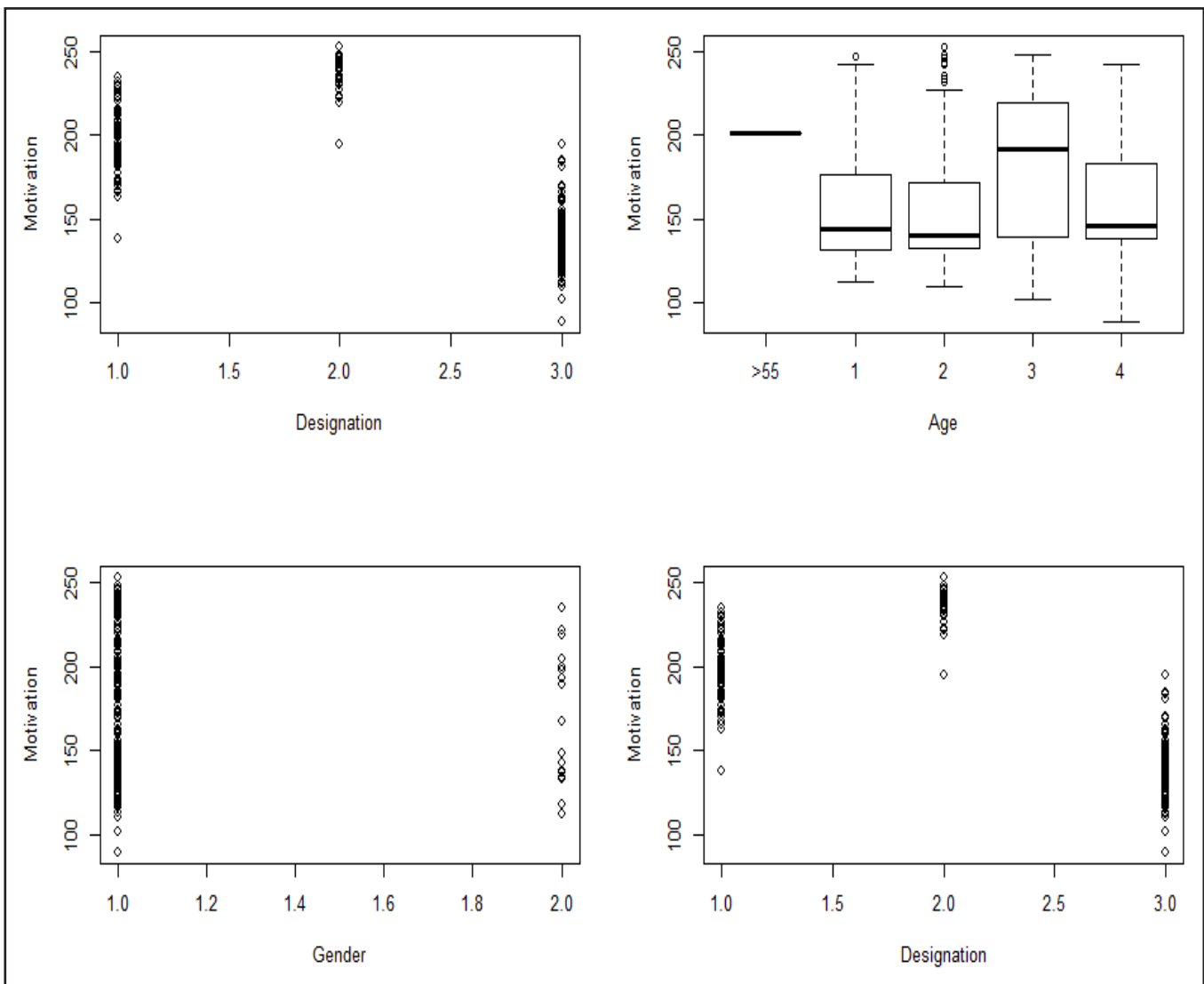**Step 2:** lda() function is used to compute linear discriminant analysis in R.

Fig. 3. Plots

The results obtained after performing Discriminant Analysis are provided below:

```
>model
Call:
Lda(MSCORE ~ Designation + Gender + Age, data =
train.data)

Prior probabilities of groups:
    HIGH        LOW       MEDIUM
0.20238095  0.03968254  0.75793651

Group means:
         Designation  Gender     Age1       Age2       Age3
HIGH     1.490196     1.058824   0.2156863  0.2745098  0.3921569    Age
4: 0.09803922
LOW      3.000000     1.200000   0.4000000  0.3000000  0.1000000    Age
4: 0.20000000
MEDIUM   2.691099     1.041885   0.3193717  0.4240838  0.1361257    Age
4: 0.12041885

Coefficients of linear discriminants:
              LD1            LD2
Designation   1.3976863      -0.07332161
Gender        0.4112514      -4.05376886
Age1          2.1142737      1.90045181
Age2          2.0976860      2.46956895
Age3          1.5995567      1.90733372
Age4          2.0590232      1.34264920

Proportion of trace:
  LD1   LD2
0.9609 0.0391
```

g) Test for Model Prediction

LDA is used to compute means and determines the probability of fitting into different groups. Predict() function is used to predict the class of the observations. Finally, model accuracy is computed by comparing the means of predicted class and the test data scores using the below command:

```
>mean(predictions$class==test.data$MSCORE)
[1] 0.6557377
```

The output shows that the model correctly classified 65.6% of observations, hence the generated model is good. This means that given the demographic factors, the model is able to predict the class of motivation level by upto 66%.

IX. CONCLUSION

The need for highly motivated and committed employees is one of the important areas that automotive industry is looking up to. The industry is confronted with agile internal and external environment factors impacting production, innovation and technology, cost and quality of products, and services [8,11,12,13].Therefore, it becomes a necessity to have highly skilled, motivated, and satisfied employees to deliver and sustain quality products and services to their stakeholders. This study shows that the motivational level is determined to a great extent by various demographic variables like age, designation, and gender. The present study will help in getting basic insight about perception of employees related to motivation in the automotive industry. The employers can identify the needs of the employee and design strategies to motivate their employees with options like rewards, challenging work assignments, recognition, appreciation, growth, and development opportunities.

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