ESTIMATING AVAILABILITY OF MIDDLE LEVEL SKILLED MANPOWER

Prakash KHANALE¹, and Anil VAINGANKAR²

¹Dnyanopasak College, Parbhani - 431401 (M.S.), India
Email: prakash_khanale@hotmail.com
²K.I.T.’s College of Engineering, Gokulshirgaon, Kolhapur MS India
Email: anil_vaingankar@yahoo.com

Note: Dr. Prakash Khanale is working as Vice Principal of Dnyanopasak college. He is associated with teaching from last 20 years. He is author of eight research papers. Dr. Anil Vaingankar has an experience of 35 years. He is author of more than sixty papers. Their current interests are Fuzzy logic and Educational Technology.

ABSTRACT
The economic reform policies are being introduced in India in phases since 1990. It demands for competent middle level skilled manpower in country. By keeping this in mind, National Council for Education, Research and Training (NCERT), New Delhi, India introduces a revised policy in 1992 and promotes vocational education. Today, several institutions are offering vocational education in almost all parts of India. In this paper we have used multiple regression technique to estimate availability of middle level skilled manpower in certain part of India. This estimation is useful to Government agencies and Industries.

Key Words: Vocational Education; Regression Technique; Statistical Technique.

INTRODUCTION
Vocationalisation of education implies an organized way of developing job related skills. It aims at laying foundations for the world of work. UNESCO associates Vocational Education (VE) with the upper secondary stage of education and defines as education designed to prepare skilled personnel at lower level of qualifications for one or group of occupations, traders or jobs [1]. The National Policy on Education of India [2] made revolutionary changes in education system.

1. The education structure is reorganized into 10+2+3 pattern.
2. Promotion of vocational education at +2 stage.

In pursuance to this, NCERT gave a scheme for introduction of vocational education. It was first introduced at higher secondary level in 1976-77. A Centrally Sponsored Scheme (CSS 1988) was introduced in 1988. This policy was further revised by NCERT in 1992, keeping in mind growing need of skilled manpower. Today, the economy of India is growing at the rate of 8% and because of ‘Globalisation’ several industries are opening up, even in rural part of India.

Regression analysis is a statistical technique primarily used for prediction of a value of variable. It can be used to analyze the relationship between single dependent variable and several independent variables. It can be used in Educational Science as well [3]. The availability of middle level skilled manpower can be estimated by using this technique. For this purpose, we have considered a case study of five districts of Marathwada region, Maharashtra State, India.

DATABASE
The estimated middle level skilled manpower are those students who are appearing for their final course of vocational education. A data of five districts of Marathwada, viz. Aurangabad (1), Beed (2), Parbhani (3), Jalna (4), and Hingoli (5) is collected. The data contains number of students studying vocational course, total number of students studying at +2 stage, and number of institutions offering education at +2 stage.

Dependent variable: Number of students studying vocational course (X₁).
Independent variables: Total number of students studying at +2 stage (X₂) and number of institutions offering +2 education (X₃).

The data collected shows the status of March 2005 [4]. Table 1 shows the database.
SETTING A BASELINE: PREDICTION WITHOUT AN INDEPENDENT VARIABLE
Baseline prediction can be done by computing mean of the dependent variable. The regression equation can be written as:

\[
\text{Predicted middle level skilled manpower} = \text{Average of } X_1.
\]

Table 2 shows the baseline prediction.

<table>
<thead>
<tr>
<th>District Code</th>
<th>(X_1)</th>
<th>(X_2)</th>
<th>(X_3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1824</td>
<td>30743</td>
<td>126</td>
</tr>
<tr>
<td>2</td>
<td>1573</td>
<td>27721</td>
<td>133</td>
</tr>
<tr>
<td>3</td>
<td>342</td>
<td>9494</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>209</td>
<td>12311</td>
<td>52</td>
</tr>
<tr>
<td>5</td>
<td>277</td>
<td>4408</td>
<td>28</td>
</tr>
</tbody>
</table>

Table 1: Database

Table 2: Baseline Prediction

From the table 2 we observe that sum of squared errors is 2468554. This error can be minimised by simple and multiple regression.

SIMPLE REGRESSION
The prediction can be further improved by considering any independent variable. For this, we have to select ‘best’ independent variable among the two independent variables. Table 3 shows the correlation matrix between \(X_1\), \(X_2\) and \(X_3\).

<table>
<thead>
<tr>
<th>Variable</th>
<th>(X_1)</th>
<th>(X_2)</th>
<th>(X_3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(X_1)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(X_2)</td>
<td>0.962663</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>(X_3)</td>
<td>0.948690</td>
<td>0.971592</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 3: Correlation Matrix

From Table 3, we observe that, variable \(X_2\) has highest correlation to dependent variable \(X_1\). Therefore, simple regression equation can be set as:

\[
X_1 = b_0 + b_1X_2
\]

In this regression equation \(b_0\) is intercept and \(b_1\) is slope. They can be find out by using mathematical procedure known as least squares [5]. By using ‘MS Excel’ program they are computed as:

\[
b_0 = -256.598000 \quad b_1 = 0.065047
\]

\[
X_1 = -256.598+0.065047X_2
\]

Table 4 shows the simple regression results.
### Simple Regression Results

<table>
<thead>
<tr>
<th>District code</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>Prediction</th>
<th>Error</th>
<th>Error Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1824</td>
<td>30743</td>
<td>1743.14400</td>
<td>80.85639</td>
<td>6537.7570</td>
</tr>
<tr>
<td>2</td>
<td>1573</td>
<td>27721</td>
<td>1546.57100</td>
<td>26.42857</td>
<td>698.4693</td>
</tr>
<tr>
<td>3</td>
<td>342</td>
<td>9494</td>
<td>360.95890</td>
<td>-18.95890</td>
<td>359.4401</td>
</tr>
<tr>
<td>4</td>
<td>209</td>
<td>12311</td>
<td>544.19640</td>
<td>-335.19600</td>
<td>112356.7000</td>
</tr>
<tr>
<td>5</td>
<td>277</td>
<td>4408</td>
<td>30.12962</td>
<td>246.87040</td>
<td>60944.9800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>2.27E-13</td>
<td>180897.3</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Simple Regression Results

Observe that compared to baseline prediction, sum of squared error decreases to 180897.3. The strength of relationship can be given by $R^2$. The value of $R^2$ is:

$$R^2 = 0.926719$$

This indicates that 92% of variation in dependent variable is explained by independent variable $X_2$. Figure 1 shows simple regression along with trend line.

### Multiple Regression

Prediction can be further improved by using another variable $X_3$. The equation for multiple regression can be written as:

$$X_1 = b_0 + b_1 X_2 + b_2 X_3$$

The values of $b_0$, $b_1$ and $b_2$ can be found out by using least squares method [5]. In ‘MS Excel’, they are computed as:

$$b_0 = -317.378 \quad b_1 = 0.04937 \quad b_2 = 4.037619$$

$$X_1 = -317.378 + 0.04937 X_2 + 4.037619 X_3$$

Table 5 shows results of multiple regression.

<table>
<thead>
<tr>
<th>District code</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>Prediction</th>
<th>Error</th>
<th>Error Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1824</td>
<td>30743</td>
<td>126</td>
<td>1709.18</td>
<td>114.8199</td>
<td>13183.62</td>
</tr>
<tr>
<td>2</td>
<td>1573</td>
<td>27721</td>
<td>133</td>
<td>1588.248</td>
<td>-15.2476</td>
<td>232.4888</td>
</tr>
<tr>
<td>3</td>
<td>342</td>
<td>9494</td>
<td>65</td>
<td>413.8245</td>
<td>-71.8245</td>
<td>5158.763</td>
</tr>
<tr>
<td>4</td>
<td>209</td>
<td>12311</td>
<td>52</td>
<td>500.4105</td>
<td>-291.41</td>
<td>84920.06</td>
</tr>
<tr>
<td>5</td>
<td>277</td>
<td>4408</td>
<td>28</td>
<td>13.33737</td>
<td>263.6626</td>
<td>69517.98</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>-192.725</td>
<td>173012.9</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Results of Multiple Regression

Observe that sum of squared error is reduced to 173012.9. The variable $X_1$ is much similar to that of $X_2$, hence prediction is little improved.
CONCLUSIONS
By using multiple regression technique it is possible to predict the availability of middle level skilled manpower. Such type of work is useful for Government for planning of vocational education. When an industry goes to open a plant in certain region of the country, it can estimate for availability of skilled manpower.

REFERENCES
1. Background paper on vocational education, NCERT, New Delhi, India (2005).