



Optimization of Human Resource Utilization in Small & Medium Manufacturing Enterprises

Bhupinder Singh and Harvinder Lal***

**Research Scholar, Department of Mechanical Engineering, RIET, Phagwara, (PB), India*

***Head, Department of Mechanical Engineering, RIET, Phagwara, (PB), India*

(Corresponding author: Harvinder Lal)

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ABSTRACT: Productivity is taken to be measure of efficiency and competitiveness. A high level of productivity can play a great role in raising the standard of living of our people. Hence, getting better results by properly implementing the productivity improvement techniques is the most important task and challenge to all managers at various levels in the industry. Considering the various factors affecting Human Resource efficiency and Human Resource utilization and combining the factors related to workers, supervisors and managers, the Human Resource Productivity ultimately becomes a function of the factors like: Selection of workers, supervisors and managers and their proper placement and promotion, Training and development of workers, supervisory and managerial staff, Experience, Work environment and Morale of workers, Supervisors and Managers. An attempt was made to prepare the detailed questionnaire on every factor mentioned above. After finding the covariance, correlation coefficients and coefficient of regression, the line of regression i.e. the line of best fit was obtained.

Keyword: Factors (Selection & Promotion, Training & Development, Experience, Work Environment, and Morale), Productivity, Rolling Mill,

I. INTRODUCTION

‘PRODUCTIVITY IS A RATIO OF OUTPUT TO INPUT’. It was noted that the majority of authors do not define what they mean by input and output, how input and output can be measured and what type of unit. This is not so far Eilon, who provide clear guidance on this matter. The lack of clarity over the definition has led to considerable confusion between productivity and other concepts as efficiency, effectiveness and performance. Many writers treat productivity and efficiency as being synonymous. Several parties are concerned with productivity, each of which sees it from their particular viewpoint and have strong views on the subject. This has contributed to the variation in the definition of productivity.

Types of Productivity:

Productivity can be classified into 3 categories.

1. Total Productivity
2. Total Factor
3. Productivity Partial Productivity

The main aim of the dissertation is to study the various factors affecting labour productivity and to mathematically evaluate the extent of influence of these factors on Human Resource Productivity.

Realizing the utmost importance and need of higher productivity for a developing country like ours with the enormously huge population and with the scarce resources, which are being consumed continuously at a faster rate, it is the crucial need of the present time to make every possible effort to maximize our productivity. Also having understood the role of Human Resource in the whole production process of the manufactured products and the various services rendered by him to the society and thereby to the nation, we must make all possible attempts to make the best utilization of this very important input resource of man-power. We should search for the every possible way to improve our Human Resource Productivity.

With this crucial thought, we started thinking on Human Resource Productivity and the various possible ways to maximize it. Whenever we think of improving Human Resource Productivity, we ought to know, at what level' it is operating now, i.e. what is its present state of condition? Once this is determined, we can very well search for the various reasons for it's not being optimum.

So, on these lines, an attempt is made to view the Human Resource Productivity with a new analytical approach with an aim to mathematically evaluate the influence of various factors which affect the Human Resource Productivity most.

II. EXPERIMENT

A. Factors Affecting Human Resource Productivity

Considering the various factors affecting Human Resource Utilization and combining the common factors related to workers, supervisors and managers, the Human Resource Productivity ultimately becomes a function of the following factors:

A - Selection of workers, supervisors and placement and promotion.

B - Training and development of workers, supervisory and managerial staff.

C - Experience.

D - Work Environment.

E - Morale of workers, Supervisors and Managers.

To evaluate the extent of influence of these factors on Human Resource Productivity, we consider an exponential model for Human Resource Productivity, as follows:

$$\text{H.R.P.} = K \cdot (A)^a (B)^b (C)^c (D)^d (E)^e \dots (1)$$

where, K - Constant of proportionality, a, b, c, d & e are the indices of the factors A, B, C, D & E respectively.

equation (1) can be written in a simpler linear first order form by taking the logarithm of both sides of the equation.

Thus, equation (1) changes to,

$$\log_{10} (\text{L.P.}) = \log_{10} K + a \log_{10} A + b \log_{10} B + c \log_{10} C + d \log_{10} D + e \log_{10} E \dots (2)$$

The mathematical values of A, B, C, D & E represents the existing conditions of these factors in the organizations under study.

In the proposed model, it is assumed that the factors considered to affect Human Resource Productivity are mutually exclusive and independent of each other. Therefore, these five factors are checked for their independence with each other and also as regards to

their individual relationship with a dependent variable. This is done by finding the correlation coefficients between Human Resource Productivity and the factors A, B, C, D & E and also obtaining regression equations among the factors having high correlation with it.

As it is desired to study and evaluate the factors affecting Human Resource Productivity and thereby identifying the weaker areas which need to be controlled to maximize it, it is very necessary to know at what level of productivity each organization is operating at present.

Therefore, we have to collect required data to measure present Human Resource Productivity in each rolling mill under study. The other information required is to know the present state or influence of the five factors A, B, C, D, & E in each mill. For the purpose of our study, six rolling mills have been visited.

Output converted in std. Man hours

We know that, H.R.P. = -----

Input of hours available

Hence, to measure Human Resource Productivity, the data of output produced during the period of one month and the total input of hours available during that period has been collected. The details are as follows:

The survey was conducted in six rolling mills at Ludhiana, Punjab. The success of the dissertation depends mostly on the proper analysis of the data collected during the survey. Hence an evaluation scheme is developed to evaluate the answers received from the workers and management personnel by getting the questionnaires filled in by them. It is necessary to check the mutual independence of factors A, B, C, D & E and their relationship with Human Resource Productivity. This can be very well done by determining the Correlation coefficients and forming regression equations between Human Resource Productivity and the individual factors and also among the various combinations of factors.

Table 1 shows the value of H.R.P and the various factors related to six rolling industries

Table 1.

Human Resource Productivity	A	B	C	D	E
88.63	78.5	32.0	88.0	73.0	72.0
86.5	78.0	39.0	79.5	76.0	85.0
78.34	91.5	37.5	85.0	78.0	62.0
75.2	83.5	38.5	83.0	83.0	61.5
71.05	74.5	28.0	81.5	74.5	52.5
64.15	77.5	24.0	80.0	69.0	40.5

Table 2.

Y = log(H.R.P.)	X ₁ = log(A)	X ₂ = log(B)	X ₃ = log(C)	X ₄ = log(D)	X ₅ = log(E)
1.948	1.895	1.507	1.944	1.863	1.857
1.937	1.891	1.591	1.901	1.881	1.929
1.894	1.961	1.573	1.929	1.892	1.792
1.876	1.991	1.587	1.919	1.919	1.787
1.851	1.872	1.447	1.911	1.872	1.722
1.807	1.889	1.380	1.903	1.839	1.607

Correlation Coefficient Matrix

	Y	X ₁	X ₂	X ₃	X ₄	X ₅
Y	1.00	0.16	0.70	0.515	0.3033	0.95
X ₁	0.16	1.00	0.559	0.401	0.54	0.14
X ₂	0.70	0.559	1.00	0.24	0.84	0.82
X ₃	0.515	0.401	0.24	1.00	0.17	0.28
X ₄	0.30	0.54	0.837	0.17	1.00	0.45
X ₅	0.95	0.14	0.82	0.28	0.45	1.00

Regression Coefficient

Factors considered	Regression Coefficient of				% fit of regression line
	X2 Training & Development	X3 Experience	X4 Work Environment	X5 Morale	
X2	0.434	--	--	--	49.00
X3	--	1.655	--	--	26.52
X4	--	--	0.5946	--	9.14 90.25
X5	--	0.849	--	0.456	97.52
X3 and X5	--	1.533	--	0.42	31.27
X3 and X4	--	1.1774	0.873	0.436	92.37
X4 and X5	--	--	-0.322	0.492	61.77
X2 and X3	0.38	--	--	--	99.90
X3, X4 & X5	--	--	-0.34	0.457	--

III. CONCLUSIONS

From the analysis of the collected data and also from the various observations and experiences during data collection, following conclusions are made:

1. Human Resource Productivity is highly related with factors 'Morale', 'Training & Development', and 'Experience'. It is also related with the factor 'Work environment' but comparatively to the lesser extent.

2. The factor 'Training and Development', is highly related with the other independent factors 'Work environment' and 'Morale' and therefore, its effect or influence on Human Resource Productivity can be merged with these two factors. So, if factors 'Morale' and 'Work environment' are considered in the model, the effect of 'Training & Development' gets accounted for.

3. There is negligible correlation of factor 'Selection and promotion' with Human Resource Productivity; this means that this factor does not have any influence on Human Resource Productivity in the field of steel rolling mills at Ludhiana.

4. Thus, Human Resource Productivity is a function of three factors i.e. 'Morale', 'Experience' and 'Work environment'. The relationship is obtained as,

$$\text{Human Resource Productivity} = (1.08144) (C)^{0.873} (D)^{0.34} (E)^{0.457}$$

5. To evaluate the real influence of 'Work environment' we should neglect 'Morale' from the assumed model and find out the relationship of Human Resource Productivity with factors 'Experience' & 'Work environment'

We obtained the relationship as,

$$\text{Human Resource Productivity} = 0.0134 (C)^{1.533} (D)^{0.436}$$

6. The following relationship of Human Resource Productivity with factors 'Morale' & 'Experience' can be considered as the best to define the human resource function.

$$\text{Human Resource Productivity} = 0.3228 (C)^{0.849} (E)^{0.42}$$

Therefore, Finally we conclude that, for optimizing the Human Resource Productivity in six rolling mills under study and the similar other mills in Ludhiana region, every possible care and efforts should be made to improve the existing conditions of the important factors, namely 'EXPERIENCE' and 'MORALE' so that they have positive effect in improving the present Human Resource Productivity. The factors 'Work environment' should be improved only if it is economically justified under the present conditions.

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