

Study and Prioritizing Effective Factors on Human Resource Productivity by Achieve Model and Topsis Method

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Abstract: With over looking to the successful countries of world we can see this counties make necessary worth to the human resource as the most important productivity factor. with contrast, this force with increasing their productivity shear themselves in the revenue of the product. Down productivity in organization, companies and etc happen with different reasons. Every reason has it's own solution for solving. Gradation of productivity is all of the systematic efforts, structured for eliminating or reducing losses of material, machine, human or incorrect balance between them. For gradation of productivity we must know effective factors on productivity. Therefore in this essay after studying the theories about productivity we choose ACHIEVE model which contain seven effective factors (Ability, Clarity, Help, Incentive, Evaluation, validity, Environment) on human resource productivity as a essay pattern and then with indexing for each of dimensions of mentioned model and with using of field method and promoting of questionnaire in the static society (ITMCO) and analyze the result of studying by using TOPSIS method, specified that between the effective factors, ability is the most important factor and evaluation is the less important factor. For testing theories we use Spearman method. The result of Spearman method showed us that there is a meaningful correlation between Ability, Clarity, Help, Incentive, Evaluation, validity, Environment with gradation of productivity. In the order -preferencing effective factors on human resource productivity that getting with the TOPSIS method with the ascending arrangement dimension: 1-Ability 2-Clarity 3-Validity 4- Incentive 5- Environment 6- Help 7- Evaluation stand.

Key words: Productivity • ACHIEVE Model • TOPSIS Method • Human resource • Human resource productivity

INTRODUCTION

Two concept of "Efficiency" and "Effectiveness" have been referred in definitions of productivity and productivity is combination of the two generally, with regard to the definition of "Effectiveness" and "Efficiency" as main concepts in recognition of productivity, it can be said that "Effectiveness" has been defined traditionally as materialization of objectives of an organization and "Efficiency" has been defined traditionally as realization of objectives of an organization and "Efficiency" has been defined as accurate and wise use of resources. "Efficiency" is defined as comparison of degree of outputs thanks to the degree of input or degree of input in comparison with output with due observance to the objectives predefined for system "Effectiveness" is defined as wise and logical use of resources with the aim

of moving towards organizational excellence performance and appropriate organizational satisfaction level.

With due observance to these two definitions, productivity is combination of both "Efficiency" and "Effectiveness".

In other words, organizational performance will be productive when activities turn "Efficient" and "Effective" and each of which solely can't indicate productivity growth. Then, as for as productivity concept is concerned, firstly, activity which is done, should be beneficial and accurate and secondly, such activity should be carried out in the best is possible in line with materialization of objectives. "Productivity" is the concept which is used for showing proportion of output of an individual unit and organization. The more productivity of an organization is increased, the less production cost will be witnessed in that unit [1].

In fast-paced development of contemporary world of today, if we intend to increase productivity of our workplace organization, production should be increased with less manpower and workforce, less capital, less time, less space and generally with fewer resources. More than any other factors, productivity of an organization strictly depends on knowledge, skills, capabilities, approaches, behavior and conduct of staff and personnel.

Basic Definition of Productivity:

- Partial productivity: "productivity" defines proportion between output and input of a system generally

$$\text{partial productivity} = \frac{\text{output}}{\text{one input production factor}}$$

- Total factor productivity: in fact, this proportion indicates a value which shows employment of staff, personnel and capital facilities of organization to raw materials, parts and purchased services subtracted out of total value of outputs [2].
- Total productivity: unlike partial productivity, total productivity shows relation between output of system with all consumed resources for producing that output [3].

Effective Factors to Productivity

Importance and Necessity of Research: During the two last decade, creation importance and extend of productivity and total productivity management in the organizations was become important.

Total productivity management, in the base of strategic plan correct attention to increasing worker's incentive improving of skills by good educational system, making good situation for innovation and rising workers talent in organization, increasing the research and development units, using the new science in doing work, improving the quality of products effort for making the suitable methods for measuring, planning and improving productivity in organization by using the management system.

By using the total productivity in organizations, the manager can define the problems and solve them by necessary information in the suitable time [4].

In the Iran Tractor manufacturing company, according to the intense competitions in the global markets, efforts for developing the bazaar and even stay in the present bazaar, the importance of attending to the productivity especially human resource productivity raised. Especially in the last years by entering the Chinese and Indians tractors, ITMCO should make serious measures for increasing the workers ability, optimum using from the present capacities and decreasing the price of products.

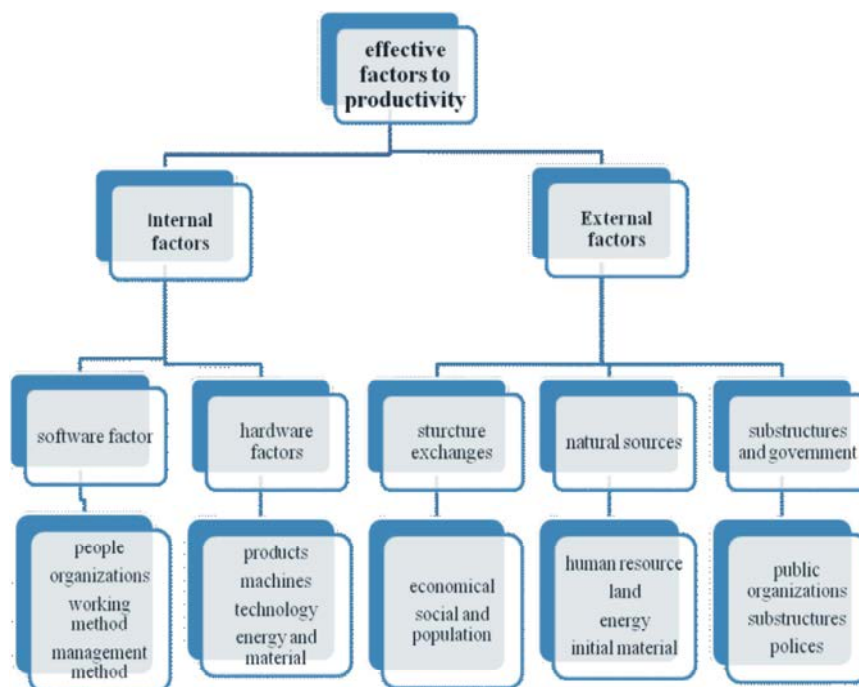


Fig. 1:

Only in this way ITMCO can enter and active in the global bazaars.

Study's Theoretical Jamb: Study's theoretical jamb is the sample that researcher opine based that about the relation between factors that are important in the creativity of problem. In the present study we use Hersi and Goldsmith's model that is contain: 1- ability 2- clarity 3-help 4-inentive 5-evaluation 6- validity 7-environment.

In this study after determining the rule of these factors on increasing human resource productivity, the order of their will determine.

Description of this model is:

$P=F(A.C.H.I.E.V.E)$

P: Productivity

A: Ability

C: Clarity

H: Help

I: Incentive

E: Evaluation

V: Validity

E: Environment

Research hypothesis:

- Worker's ability is effective on the gradation of human resource productivity.
- Job's clarity is effective on the gradation of human resource productivity.
- Organization help is effective on the gradation of human resource productivity.
- Worker's incentive is effective on the gradation of human resource productivity.
- Worker's performance evaluation is effective on the gradation of human resource productivity.

- Rules validity is effective on the gradation of human resource productivity.
- Environment is effective on the gradation of human resource productivity.
- There is meaningful difference among the effective factors of gradation of human resource productivity.

Research Analysis Model: According to the study's theoretical jamb, we show research analysis model like this:

Study's Method: From the goal attitude, the present study method is application and from the method attitude is descriptive traversal and from the two way we use for collecting data. The first, from the library way for collecting literate and research history, inside and outside of country. The second, by the field way by distributing questionnaire among the Iran Tractor Manufacturing company's human resource.

Sampling Method: In this research we selected 300 workers from ITMCOM through the application of random sampling method.

For determining the number of sample from the statistic society we use Morgan's table that for 1000 workers from the statistic society with significant level 95% and considered equal to 5% the number of statistic sample will be 278 that we choose 300 workers for more confidence.

Collecting Information Equipment: We used questionnaire and documents of ITMCO for gathering necessary information. The questionnaire contains personal qualification, information sources questions, five selection questions according to Likert spectrum.

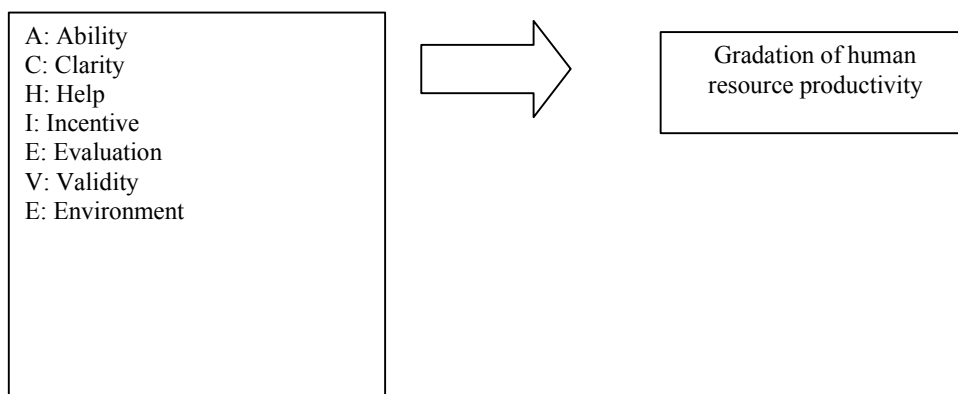


Fig. 2:

Table 1

Very weak	Weak	Average	Strong	Very strong
1	2	3	4	5

Table 2:

Korenbach Alpha coefficient	Number of question
0.9265	28

Validity and Permanent of Questionnaire: For calculating validity of this research we used symbolic validity. For calculating permanent of questionnaire we used Korenbach Alpha coefficient and we obtain 0.9265 by using SPSS software and this number shows our questionnaire is very permanent.

Data Analysis Method: For analyzing data we use descriptive statistics and indirect comprehensive statistics. For this purpose we used SPSS software.

In descriptive statistics level we used statistic index for analyze data. For measuring effective factors on productivity we use Spearman test. At last we used TOPSIS method for prioritizing effective factor. We explain TOPSIS method as a algorithm during we calculate it.

Spearman Ranking Correlation Coefficient: Spearman ranking correlation coefficient is a kind of Peayerson correlation and it is used for ranking scores. In other words our variant data is classified. For calculating Spearman ranking correlation coefficient we use this formula [5].

$$r_s = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

r_s = Spearman ranking correlation coefficient

D^2 = squer of difference between ranks

n = number of rank

In this research we use Spearman method for testing our theories.

Test of Normality of Gathered Data: According to up information because of the $\text{sig} \leq 0.05$ we concluded that our data is not normal and we should use non-parametric method like Spearman for testing our hypothesis.

Data Analysis

Testing Analysis: We test each of research theories by using Spearman method and we specify the result of test for each of theories.

BAHRVARY=productivity

TAVANAY=ability

VOZOH=clarity

ANGIZE=incentive

HEMAYAT=help

ARZYABI=evaluation

EATEBAR=validity

MOHET=environment

Hypothesis 1: The measure of Spearman correlation coefficient ($r_s = 0.639$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between worker's ability and productivity.

Hypothesis 2: The measure of Spearman correlation coefficient ($r_s = 0.747$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between job's clarity and productivity.

Hypothesis 3: The measure of Spearman correlation coefficient ($r_s = 0.812$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between worker's incentive and productivity.

Hypothesis 4: The measure of Spearman correlation coefficient ($r_s = 0.746$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between organization Help and productivity.

Hypothesis 5: The measure of Spearman correlation coefficient ($r_s = 0.744$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between worker's performance evaluation and productivity.

Hypothesis 6: The measure of Spearman correlation coefficient ($r_s = 0.824$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between rules validity and productivity.

Hypothesis 7: The measure of Spearman correlation coefficient ($r_s = 0.853$) and significant level $\text{sig}=0.000$ shows that with 95% confidence there is a significant relation between environment and productivity.

TOPSIS Method: TOPSIS method was proposed by Hwany and Yoon in 1981. This method is one of the best multi-criteria decision-making models and is used numerously. At this method, alternative m is evaluated by indicator n .

Table 3: One-Sample Kolmogorov-Smirnov Test

		X1	X2	X3	X4
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	4.38	4.40	3.27	4.07
	Std. Deviation	.710	.664	.912	.630
Most Extreme	Absolute	.307	.317	.252	.309
Differences	Positive	.205	.226	.248	.309
	Negative	-.307	-.317	-.252	-.291
Kolmogorov-Smirnov Z		5.323	5.486	4.359	5.349
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 4: One-Sample Kolmogorov-Smirnov Test

		X5	X6	X7	X8
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	3.85	3.97	4.00	3.97
	Std. Deviation	.899	.753	.754	.857
Most Extreme	Absolute	.257	.251	.250	.232
Differences	Positive	.193	.232	.233	.184
	Negative	-.257	-.251	-.250	-.232
Kolmogorov-Smirnov Z		4.449	4.347	4.330	4.021
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 5: One-Sample Kolmogorov-Smirnov Test

		X9	X10	X11	X12
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	3.25	3.40	3.75	3.75
	Std. Deviation	.889	1.022	.908	1.151
Most Extreme	Absolute	.227	.219	.225	.236
Differences	Positive	.227	.219	.179	.139
	Negative	-.223	-.181	-.225	-.236
Kolmogorov-Smirnov Z		3.939	3.793	3.900	4.087
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 6: One-Sample Kolmogorov-Smirnov Test

		X13	X14	X15	X16
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	3.87	3.75	3.68	3.47
	Std. Deviation	.905	1.076	.976	.807
Most Extreme	Absolute	.214	.227	.208	.262
Differences	Positive	.214	.224	.208	.202
	Negative	-.197	-.227	-.177	-.262
Kolmogorov-Smirnov Z		3.712	3.937	3.603	4.544
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 7: One-Sample Kolmogorov-Smirnov Test

		X17	X18	X19	X20
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	4.05	3.77	3.58	3.63
	Std. Deviation	.992	.991	1.310	.932
Most Extreme	Absolute	.231	.210	.225	.220
Differences	Positive	.169	.164	.140	.185
	Negative	-.231	-.210	-.225	-.220
Kolmogorov-Smirnov Z		3.999	3.633	3.894	3.805
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 8: One-Sample Kolmogorov-Smirnov Test

		X21	X22	X23	X24
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	3.38	3.25	4.03	3.85
	Std. Deviation	.934	1.028	.914	1.048
Most Extreme	Absolute	.262	.246	.269	.257
Differences	Positive	.171	.246	.181	.143
	Negative	-.262	-.187	-.269	-.257
Kolmogorov-Smirnov Z		4.539	4.261	4.655	4.450
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 9: One-Sample Kolmogorov-Smirnov Test

		X25	X26	X27	X28
N		300	300	300	300
Normal Parameters ^{a,b}	Mean	4.08	3.77	3.60	3.93
	Std. Deviation	.782	.762	1.115	1.197
Most Extreme	Absolute	.224	.320	.173	.263
Differences	Positive	.209	.246	.171	.187
	Negative	-.224	-.320	-.173	-.263
Kolmogorov-Smirnov Z		3.884	5.547	3.003	4.564
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

a. Test distribution in Normal.

b. Calculated from data.

Table 10:

		Correlation		
			TAVANAY	BAHRVARY
Spearman's rho	TAVANAY	Correlation	1.000	.639**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.639**	1.000
		Sig. (1-tailed)	.000	
		N	300	300

** . Correlation is significant at the .01 level (1-tailed).

Table 11:

		Correlation		
			VOZOH	BAHRVARY
Spearman's rho	VOZOH	Correlation	1.000	.747**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.747**	1.000
		Sig. (1-tailed)	.000	
		N	300	300

** . Correlation is significant at the .01 level (1-tailed).

Table 12:

		Correlation		
			ANGIZE	BAHRVARY
Spearman's rho	ANGIZE	Correlation	1.000	.812**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.812**	1.000
		Sig. (1-tailed)	.000	
		N	300	300

** . Correlation is significant at the .01 level (1-tailed).

Table 13:

		Correlation		
			HEMAYAT	BAHRVARY
Spearman's rho	HEMAYAT	Correlation	1.000	.746**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.746**	1.000
		Sig. (1-tailed)	.000	
		N	300	3000

** . Correlation is significant at the .01 level (1-tailed).

Table 14:

		Correlation		
			ARZYABI	BAHRVARY
Spearman's rho	ARZYABI	Correlation	1.000	.744**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.744**	1.000
		Sig. (1-tailed)	.000	
		N	300	3000

** . Correlation is significant at the .01 level (1-tailed).

Table 15:

		Correlation		
			EATEBAR	BAHRVARY
Spearman's rho	EATEBAR	Correlation	1.000	.824**
		Sig. (1-tailed)		.000
		N	300	300
	BAHRVARY	Correlation	.824**	1.000
		Sig. (1-tailed)	.000	
		N	300	3000

** . Correlation is significant at the .01 level (1-tailed).

Table 16:

Correlation				
Spearman's rho	MOHET	Correlation	MOHET	BAHRVARY
		Sig. (1-tailed)	1.000	.853**
		N	300	300
	BAHRVARY	Correlation	.853**	1.000
		Sig. (1-tailed)	.000	
		N	300	3000

** . Correlation is significant at the .01 level (1-tailed).

Basis of this technique stands at the concept that multiple choice should enjoy less space with positive ideal solution(best possible status) and the most space with negative ideal solution(the worst possible way).

It has been assumed that fairness of any indicator will be increased or decreased concertedly [6].

Prioritizing Effective Factors on Gradation of Human Resource Productivity [7]

Step 1: making decision matrix

$$\begin{matrix} \text{Productivity} \\ \begin{bmatrix} A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \\ A_6 \\ A_7 \end{bmatrix} \end{matrix} = \begin{bmatrix} 3.99 \\ 3.93 \\ 3.64 \\ 3.68 \\ 3.61 \\ 3.70 \\ 3.68 \end{bmatrix}$$

A1: ability
A2: clarity
A3: help
A4: incentive
A5: evaluation
A6: validity
A7: environment

Step 2: Making dimension matrix

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^m r_{ij}^2}}$$

$$N_D = \begin{bmatrix} 0.402 \\ 0.396 \\ 0.367 \\ 0.371 \\ 0.364 \\ 0.373 \\ 0.371 \end{bmatrix}$$

Step 3: making w matrix by using anthropy technique:

$$P_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^m r_{ij}^2}}$$

$$p = \begin{bmatrix} 0.152 \\ 0.150 \\ 0.139 \\ 0.140 \\ 0.138 \\ 0.141 \\ 0.140 \end{bmatrix}$$

Now by using this formula we can calculate E_j :

$$E_j = -K \sum_{i=1}^m (p_{ij} \cdot \ln p_{ij}); \forall j$$

In this formula $K = \frac{1}{\ln m}$ and m shows the number of decision matrix rows.

For calculating w_j we have:

$$w_j = \frac{d_j}{\sum_{j=1}^n d_j}$$

In the mentioned formula n shows the number of decision matrix columns.

Step 4: making weight dimensionless matrix V by using W

$$V = N_D \cdot W_{n \times n} = \begin{bmatrix} v_{11} & \cdots & v_{1n} \\ \vdots & \ddots & \vdots \\ v_{m1} & \cdots & v_{mn} \end{bmatrix}$$

$$v = \begin{bmatrix} 0.402 \\ 0.396 \\ 0.367 \\ 0.371 \\ 0.364 \\ 0.373 \\ 0.371 \end{bmatrix}$$

Table 17:

	X_i
Ej	0.987
dj = 1 - Ej	0.013
wj	1

Table 18:

$d_{1+} = 0$	$d_{1-} = 0.038$
$d_{2+} = 0.006$	$d_{2-} = 0.032$
$d_{3+} = 0.035$	$d_{3-} = 0.003$
$d_{4+} = 0.031$	$d_{4-} = 0.007$
$d_{5+} = 0.038$	$d_{5-} = 0$
$d_{6+} = 0.029$	$d_{6-} = 0.009$
$d_{7+} = 0.031$	$d_{7-} = 0.007$

Step 5: specifying ideal solution and negative - ideal solution:

$$\text{ideal solution} = A^+ = (\max V_{ij}; j \in J) = \{V_1^+, \dots, V_j^+, \dots, V_n^+\}$$

$$\text{negative - ideal solution} = A^- = (\min V_{ij}; j \in J) = \{V_1^-, \dots, V_j^-, \dots, V_n^-\}$$

$$A^+ = \{0.402\}$$

$$A^- = \{0.364\}$$

Step 6: Obtaining space rate of each factor up to positive and negative ideal:

$$d_{i+} = \left\{ \sum_{j=1}^n (V_{ij} - V_j^+)^2 \right\}^{0.5}$$

$$d_{i-} = \left\{ \sum_{j=1}^n (V_{ij} - V_j^-)^2 \right\}^{0.5}$$

Step 7: Obtaining relative determination of cl_{i+} as one factor to ideal solution:

$$cl_{i+} = \frac{d_{i-}}{(d_{i+} + d_{i-})}$$

$$0 \leq cl_{i+} \leq 1; i = 1, 2, \dots, m$$

$$cl_{1+} = 1 \rightarrow A1$$

$$cl_{2+} = 0.84 \rightarrow A2$$

$$cl_{3+} = 0.078 \rightarrow A3$$

$$cl_{4+} = 0.18 \rightarrow A4$$

$$cl_{5+} = 0 \rightarrow A5$$

$$cl_{6+} = 0.237 \rightarrow A6$$

$$cl_{7+} = 0.18 \rightarrow A7$$

Step 8: priority factors rating

A1= ability

A2= clarity

A6 = validity

A4 = incentive

A7= environment

A3= help

A5= evaluation

RESULT AND DISCUSSION

According to information that we obtain by using questionnaire, analyze them with Spearman method and prioritizing factors by TOPSIS method, it is specified that two factors(ability and clarity) is the most effective on gradation of human resource productivity but organization help, incentive, evaluation, rules validity and environment are the factors that are less effective. So it must be analyzed and these factors must be noticed in ITMCO, so by proving these factors the productivity can increase.

By attention to result of this research, ability and clarity obtain the most effective factor on gradation of productivity. So for making human resource productive, ITMCO must carry on specialty courses for workers, value the creativity of personnel, for achieving the goals of organization. Fertilised the talent of workers is also effective, also workers must be knowed about the goals of organization so they can forward to those goals.

Suggestions:

- By attention to considerable effect of worker's ability, we suggest that by using analysis of job, the various ability of human resource are recognized and organization can carry on specialty courses for gradation of human ability.
- By attention to considerable effect of job clarity on gradation of human resource, we suggest by documenting explanation of duty, identity certificate of organization and by using information technology for informing or prepare the information about the jobs, can take action for gradation of human productivity.

- By attention to ACHIEVE model, other factors are also effective on gradation but in our statisticsociety this factors are less effective. So we suggest to other researcher that they study these factors again and analyze the reason of little effect in this statistics society and in other statistic society.

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No.	question	Very strong	Strong	Average	Weak	Very weak
1	How much does effect related education on graduation of human resource productivity?					
2	How much does effect work experience on graduation of human resource productivity?					
3	Did general training which is held in the company is effective on graduation of human resource productivity?					
4	How much does effect job talent on graduation of human resource productivity?					
5	Is knowing the work responsibility effective on graduation of human resource productivity?					
6	How much does effect innovation and creativity of workers on graduation of human resource productivity?					
7	How much does effect the clarity of work on graduation of human resource productivity?					
8	How much does effect being direct and job goal on graduation of human resource productivity?					
9	How much does effect proportional jurisdiction with job responsibility on graduation of human resource productivity?					
10	How much does effect available equipment and facilities in organization on graduation of human resource productivity?					
11	How much does effect special training about work which was held in organization on graduation of human resource productivity?					
12	How much does effect comfort facilities that is made by company on graduation of human resource productivity?					
13	How much does effect using of competent manager on graduation of human resource productivity?					
14	How much does effect appreciation and help of manager from operation of outstand workers on graduation of human resource productivity?					
15	How much does effect job promotion on graduation of human resource productivity?					
16	How much does effect information technology in organization on graduation of human resource productivity?					
17	How much does effect on time salary payment on graduation of human resource productivity?					
18	How much does effect workers participation in decision on graduation of human resource productivity?					
19	How much does effect not biasing toward some employees on graduation of human resource productivity?					
20	How much does effect using workers opinion on determining company's goals in each section on graduation of human resource productivity?					
21	How much does effect establishing suitable connection with other units in organization on graduation of human resource productivity?					
22	How much does effect valuation system and continuous controlling on graduation of human resource productivity?					
23	How much does effect proportion of job with bodily situation on graduation of human resource productivity?					
24	How much does effect manager's information about advanced technology in tractor manufacturing on graduation of human resource productivity?					
25	How much does effect job knowledge on graduation of human resource productivity?					
26	How much does effect manager decision match with company's strategy on graduation of human resource productivity?					
27	How much does effect exist connection method between workers and manager about workers problems on graduation of human resource productivity?					
28	How much does effect proportion between economic situation and workers living condition on graduation of human resource productivity?					