STUDY AND PRIORITIZING EFFECTIVE FACTORS ON HUMAN RESOURCE PRODUCTIVITY BY ACHIEVE MODEL AND TOPSIS METHOD
THE CASE STUDY OF IRAN TRACTOR MANUFACTURING COMPANY

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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 its 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 (Boudreau 1983).

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**

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

\[
\text{Partial productivity} = \frac{\text{output}}{\text{one input production factor}}
\]

2-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 (Lam & Lam 2005)

3- Total productivity: unlike partial productivity, total productivity shows relation between output of system with all consumed resources for producing that output (Hannula, 2002).

**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. (Taheri, 1385, 12)

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

Study's Theoretical Jamb

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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-incentive 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**

1- Worker's ability is effective on the gradation of human resource productivity.  
2- Job's clarity is effective on the gradation of human resource productivity.  
3- Organization help is effective on the gradation of human resource productivity.  
4- Worker's incentive is effective on the gradation of human resource productivity.  
5- Worker's performance evaluation is effective on the gradation of human resource productivity.  
6- Rules validity is effective on the gradation of human resource productivity.  
7- Environment is effective on the gradation of human resource productivity.  
8- 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.

Validity and Permanent of Questionnaire

For calculating validity of this research we used symbolic validity. For calculating permanent of questionnaire we used Korenbakh 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(Delavar,1387)
In this research we use Spearman method for testing our theories.

Data 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. H0: Worker's ability is not effective on gradation of human resource productivity.
   H1: Worker's ability is effective on gradation of human resource productivity.

<table>
<thead>
<tr>
<th>Correlation Coefficient</th>
<th>TAVANAY</th>
<th>BAHRVARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td>1.000</td>
<td>.639**</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>.</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>BAHRVARY</td>
<td></td>
<td></td>
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<tr>
<td>Correlation Coefficient</td>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.</td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

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

The measure of Spearman correlation coefficient ($r_s = 0.639$) and significant level sig=0.000 shows that with 95% confidence there is a significant relation between worker's ability and productivity then H1 is true.

2. H0: Job's clarity is not effective on gradation of human resource productivity.
   H1: Job's clarity is effective on gradation of human resource productivity.
The measure of Spearman correlation coefficient (\( \rho_s = 0.747 \)) and significant level \( \text{sig}=0.000 \) shows that with 95% confidence there is a significant relation between job’s clarity and productivity then H1 is true.

3. H0: Worker's incentive is not effective on gradation of human resource productivity. 
H1: Worker's incentive is effective on gradation of human resource productivity.

The measure of Spearman correlation coefficient (\( \rho_s = 0.812 \)) and significant level \( \text{sig}=0.000 \) shows that with 95% confidence there is a significant relation between worker's incentive and productivity then H1 is true.

4. H0: Organization Help is not effective on gradation of human resource productivity. 
H1: Organization Help is effective on gradation of human resource productivity.

The measure of Spearman correlation coefficient (\( \rho_s = 0.746 \)) and significant level \( \text{sig}=0.000 \) shows that with 95% confidence there is a significant relation between organization Help and productivity then H1 is true.
5. H0: Worker's performance evaluation is not effective on gradation of human resource productivity.
   H1: Worker's performance evaluation is effective on gradation of human resource productivity.

   Correlations
   
<table>
<thead>
<tr>
<th>Spearman's rho</th>
<th>ARZYABI Correlation Coefficient</th>
<th>ARZYABI</th>
<th>BAHRVARY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.000</td>
<td>.744**</td>
<td></td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
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<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

   Correlations
   
<table>
<thead>
<tr>
<th>Spearman's rho</th>
<th>EATEBAR Correlation Coefficient</th>
<th>EATEBAR</th>
<th>BAHRVARY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.000</td>
<td>.824**</td>
<td></td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>.</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

   The measure of Spearman correlation coefficient \( \rho_s = 0.744 \) and significant level sig=0.000 shows that with 95% confidence there is a significant relation between worker's performance evaluation and productivity then H1 is true.

6. H0: Rules validity is not effective on gradation of human resource productivity.
   H1: Rules validity is effective on gradation of human resource productivity.

   Correlations
   
<table>
<thead>
<tr>
<th>Spearman's rho</th>
<th>EATEBAR Correlation Coefficient</th>
<th>EATEBAR</th>
<th>BAHRVARY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.000</td>
<td>.824**</td>
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<tr>
<td>Sig. (1-tailed)</td>
<td>.</td>
<td>.000</td>
<td></td>
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<tr>
<td>N</td>
<td>300</td>
<td>300</td>
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</tr>
</tbody>
</table>

   The measure of Spearman correlation coefficient \( \rho_s = 0.824 \) and significant level sig=0.000 shows that with 95% confidence there is a significant relation between rules validity and productivity then H1 is true.

7. H0: Environment is not effective on gradation of human resource productivity.
   H1: Environment is effective on gradation of human resource productivity.
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 then H1 is true.

**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 \( n \). 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 (Shih, Shyur and Lee, 2007)

**Prioritizing Effective Factors on Gradation of Human Resource Productivity**

*(Asgharpour, 1389)*

**Step 1:** making decision matrix

\[
\begin{bmatrix}
A_1 & \text{ability} \\
A_2 & \text{clarity} \\
A_3 & \text{help} \\
A_4 & \text{incentive} \\
A_5 & \text{evaluation} \\
A_6 & \text{validity} \\
A_7 & \text{environment}
\end{bmatrix} = \begin{bmatrix}
3.99 \\
3.93 \\
3.64 \\
3.68 \\
3.61 \\
3.70 \\
3.68
\end{bmatrix}
\]

**Step 2:** making dimension matrix

\[
n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{n} r_{ij}^2}}
\]
Step 3: making \( W \) matrix by using anthropy technique:

\[
P_i = \frac{n_{ij}}{\sum_{j=1}^{n} n_{ij}}
\]

\[
p = \begin{bmatrix}
0.152 \\
0.150 \\
0.139 \\
0.140 \\
0.130 \\
0.141 \\
0.140
\end{bmatrix}
\]

Now by using this formula we can calculate \( E_j \):

\[
E_j = -K \sum_{i=1}^{m} (p_{ij} \cdot \text{Imp}_{ij}) \forall j
\]

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

\[
k = \frac{1}{\ln 7} = 0.51
\]

<table>
<thead>
<tr>
<th>( \bar{X}_i )</th>
<th>( E_j )</th>
<th>( d_j = 1 - E_j )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.987</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For calculating \( w_j \) we have:

\[
w_j = \frac{d_j}{\sum_{i=1}^{m} d_i}
\]

In the mentioned formula \( m \) shows the number of decision matrix columns.

Step 4: making weight dimensionless matrix \( V \) by using \( W \)

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

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

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

ideal solution = \( A^+ = (\max V_{ij} ; i \in I) = \{V^+_1, \ldots, V^+_j, \ldots, V^+_n\} \)

negative - ideal solution = \( A^- = (\min V_{ij} ; j \in J) = \{V^-_1, \ldots, V^-_j, \ldots, V^-_n\} \)
Step 6: obtaining space rate of each factor up to positive and negative ideal:

\[ d_{i+} = \left( \frac{1}{n} \sum_{j=1}^{n} (V_{ij} - V_{j+})^2 \right)^{\frac{1}{2}} \]

\[ d_{i-} = \left( \frac{1}{n} \sum_{j=1}^{n} (V_{ij} - V_{j-})^2 \right)^{\frac{1}{2}} \]

<table>
<thead>
<tr>
<th>Factor</th>
<th>( d_{i+} )</th>
<th>( d_{i-} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.000</td>
<td>0.032</td>
</tr>
<tr>
<td>A2</td>
<td>0.000</td>
<td>0.032</td>
</tr>
<tr>
<td>A3</td>
<td>0.035</td>
<td>0.003</td>
</tr>
<tr>
<td>A4</td>
<td>0.031</td>
<td>0.007</td>
</tr>
<tr>
<td>A5</td>
<td>0.038</td>
<td>0.029</td>
</tr>
<tr>
<td>A6</td>
<td>0.038</td>
<td>0.029</td>
</tr>
<tr>
<td>A7</td>
<td>0.031</td>
<td>0.009</td>
</tr>
<tr>
<td>A8</td>
<td>0.029</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Step 7: Obtaining relative determination of \( c_{i+} \) as one factor to ideal solution:

\[ c_{i+} = \frac{d_{i-}}{d_{i+} + d_{i-}} \]

\[ 0 \leq c_{i+} \leq 1, \ 1, 2, \ldots, m \]

- \( c_{1+} = 1 \) - A1
- \( c_{2+} = 0.84 \) - A2
- \( c_{3+} = 0.78 \) - A3
- \( c_{4+} = 0.18 \) - A4
- \( c_{5+} = 0 \) - A5
- \( c_{6+} = 0.237 \) - A6
- \( c_{7+} = 0.16 \) - A7

Step 8: priority factors rating

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

DISCUSSION AND CONCLUSION

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 knewed about the goals of organization so they can forward to those goals.

SUGGESTION

1- 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.

2- 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.

3- By attention to ACHIEVE model, other factors are also effective on gradation but in our statistics society 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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