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Studying the influence of information and communication technology on human resource productivity

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ABSTRACT

The purpose of writing the current paper is to survey the influence of information and communication technology (ICT) on human resource productivity (HRP). First of all, by applying Chi-square test, the relationship between ICT with human HRP and its indices was proved. After that by applying Average test, the variables levels were calculated in which all of them except "creativity and innovation" were placed in favorable places. Finally by utilizing one of new MCDM techniques (fuzzy TOPSIS) the indices were prioritized in which "human resource management, planning and improvement", "cooperating in supply chain to create added value for customers" and "evaluating some methods for risks accountability" were selected as the top ones.

Introduction

Nowadays attending to increasing competitiveness, complexity, technology and lack of resources, surveying productivity is so important for every organization. Despite productivity importance, its concept is not clear for lots of managers and leaders (Sink, 1985).

All organizations needs educated and experienced people to access their mission. If employees' capabilities do not meet these needs, it is not necessary to develop these skills (Dulhan and Shuller).

Developing countries are binding to utilize more advanced techniques, saving operation costs and enhancing production factor of productivity. But one of the reasons of technological progress and operation productivity is improving human resource skills and expertise (Alvani and Ahmadi, 2001).

From the other side, information and communication technology effects on most of human life aspects and of course society. So information and communication technology growth and development illustrates improvement rate in society various dimensions (Peak et al, 2005).

In most of Iranian organizations which "organization and research organization" is one of them, the managers do not attend to human resources and the organization is not a suitable place for flourishing and developing employees' capabilities and talents. So the easiest resources for change, is human resources. In the mentioned organization, human resource productivity is really low and the people are involved stress. Therefore the main questions of the research are:

✓Is there any positive and meaningful correlation between information and communication technology with human resource productivity and its indices?

✓How is the ranking of the human resource productivity indices?

Literature review

Human resource productivity

Nowadays attending to workforce have been centre of managers and leaders' attention and some words like "motivation", "creativity", "satisfaction" and "education" are more and more applicable in organizations which no organization can not ignore it. The role of human resource and workforce is so much that the human resource productivity has been so important. Most of researchers believed that human resource quality leads to produce and present better productions and services and make organizations more powerful ti attract capital which finally put organizations in path of economic growth (Nadler and Lowler, 1983).

It can be claimed that productivity indices in the services sector depends on human factors (human resource). Japan productivity center (JPC) defined to enhance productivity of employees in three factors: development of employees is included empowerment and their education, participative management, justice and equitable distribution (understanding of employees from equitable distribution and productivity growth); likewise, this center (JPC) knows factors of speed of operations, quality of operations, unit cost, job flexibility, people commitment, right communications, understanding of productivity, satisfaction and quality of work life and goodness of people participation as indexes of people productivity (Yaghoobi et al, 2011).

Human resource growth and development dimensions can affect on human resource and of course organizational productivity (Haji Karimi and Rangriz, 2000).

Human resource productivity means efficient, effective and useful application of the most important factor in organizations - human resources (Shah Beygi, 1994).

Information and communication technology

In keeping with the complex nature and multiple applications, information and communication technology (ICT)

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may be considered in different ways. One of the most important definitions was presented by World Bank as "the set of activities that facilitate by electronic means the processing, transmission and display of information" (Rodriguez and Wilson, 2000).

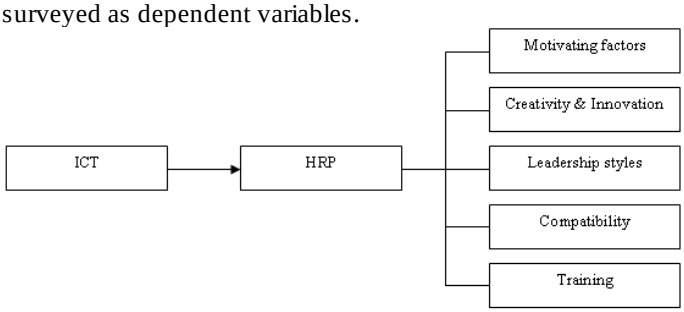
Information and communication technology includes technologies which people use to share, distribute, gather information and to communicate, through computers and computer networks (ESCAP, 2001).

Information and communication technology is a complex and various of goods, applications and services utilized for producing, distributing, processing, transforming information consist of telecoms, TV and radio broadcasting, hardware and software, computer services and electronic media" (Marcelle, 2000).

It represents a cluster of associated technologies defined by their functional usage in information access and communication, of which one embodiment is the Internet. Given the two general services of the system the multitude of services allowed…is unprecedented". It was represented by the Internet, deliver "at once a worldwide broadcasting capability, a mechanism for information dissemination, a medium for interaction between people and a marketplace for goods and services" (Kiiski and Pohjola, 2001).

Conceptual framework of research and hypotheses

The chart below shows the impact of information and communication technology on human resource productivity. In the paper, ICT has been considered as independent variable and HRP (consist of motivating factors, creativity and innovation, leadership styles, compatibility and training) have been surveyed as dependent variables.



Conceptual framework of research

1. ICT has positive and meaningful influence on human resource productivity.

1.1. ICT has positive and meaningful influence on employees' motivation factors.

1.2. ICT has positive and meaningful influence on employees' creativity and innovation.

1.3. ICT has positive and meaningful influence on employees' leadership styles.

1.4. ICT has positive and meaningful influence on employees' compatibility.

1.5. ICT has positive and meaningful influence on employees' training.

Research methodology

Society for this research is 52 people who work in education and research organization. This number seems to be adequate, so no sampling strategy was utilized.

The current study is considered as a descriptive survey if to view from data collection aspect and is an applied research if to investigate the goals of the research. For gathering the data library method (to refer to books, articles, theses and etc) and fieldworks (questionnaire) was being applied. The questionnaire was designed for measuring the influence of ICT on HRP and its indices; 44 questions in were designed and then distributed within the samples. Distributions of each variable were presented in table 1:

Table 1. Distribution of each variable

HRP indices	Number of questions
Motivating factors	1-15
Creativity and innovation	16-23
Leadership styles	24-34
Compatibility	35-40
	41-44

To analyze the data SPSS 17 (Chi-square and Average tests) and of course fuzzy TOPSIS technique were utilized. The management experts were being asked to evaluate the questionnaire validity. For this purpose, the questionnaire was given to some professors and experts in management, and after their modifications were being utilized and they confirmed it, the questionnaires were given to the samples. For determining the questionnaires' reliability, the 'Cronbach Alfa technique' was utilized. For this purpose, 35 people were chosen by random (from the samples) and the questionnaire was given to them. The 'Cronbach Alfa' value for the questionnaire was calculated 0.79.

As this number is more than 0.7, so the reliability of questionnaire was proved.

Data Analysis and Discussion

Chi-square test

Chi-square test was utilized to survey the relationship between ICT with HRP and its indices. The results are presented in table 2:

Table 2. Results of using Chi-square test

Independent Variable	Dependent Variable	P-Value	Standard Error	Results
ICT	HRP	6.725	0.016	Accepted
ICT	Motivating factors	7.248	0.004	Accepted
ICT	Creativity and innovation	6.254	0.021	Accepted
ICT	Leadership styles	8.586	0.037	Accepted
ICT	Compatibility	12.706	0.013	Accepted
ICT	Training	8.425	0.029	Accepted

Table 2 shows that there are positive and meaningful relationship between ICT with HRP and its indices.

Average test

Average test was applied to survey variables levels. The results are shown in table below:

Table 3. Results of using Average test

Variable	$Z_{0.05}$	Z- Value	Results
HRP	1.645	4.22	Favorable level
Motivating factors	1.645	2.37	Favorable level
Creativity and innovation	1.645	1.34	Unfavorable level
Leadership styles	1.645	3.17	Favorable level
Compatibility	1.645	3.69	Favorable level
Training	1.645	2.58	Favorable level

As table 3 shows all variables apart from "creativity and innovation" were placed in satisfied levels.

Table 4. Positive and negative ideal solution, closeness rate and final rank of variables

Variables	D_i^+	D_i^-	Cc_i	Final rank
Formulating organizational mission and vision	*2.756351866*	*2.641257107*	*0.489338357*	13
Formulating values, ethics and responsibilities	*3.486837349*	*1.656667254*	*0.322089194*	40
Existence in improvement activities	*3.29119651*	*1.883970394*	*0.364040509*	35
Act in base of learning activities	*2.628166694*	*2.523856476*	*0.489876771*	12
Encourage to interorganizational cooperation	*2.764878374*	*2.399330846*	*0.464607599*	18
Review and effectiveness improvement by leaders	*2.474268241*	*2.681746046*	*0.52011998*	10
Information gathering for market definition	*3.183346934*	*1.990993982*	*0.384782142*	31
Analyzing learning activities outputs	*2.303201184*	*2.898045785*	*0.557182884*	6
Analyzing rivals performance	*3.143633695*	*2.018827898*	*0.391059161*	29
Indentifying geographical and economical indices	*2.681906685*	*2.482730744*	*0.480717336*	15
Identifying competitive advantages	*2.637363796*	*2.482894889*	*0.484915908*	14
Evaluating methods for risk responsibilities	*2.179587758*	*2.974430572*	*0.57710904*	3
Human resource management, planning and improvement	*1.944402004*	*3.225540265*	*0.623902569*	1
Indentifying and developing employees' competencies	*3.316027082*	*1.815947576*	*0.353849677*	37
Employees' cooperation and empowerment	*2.897311565*	*2.237547785*	*0.435756392*	23
Two-side conversation between employees and managers	*3.48171398*	*1.684017568*	*0.325997887*	39
Employees encourage	*2.268488356*	*2.873982467*	*0.558871905*	5
Cooperating in supply chain for creating customers' added value	*2.045443024*	*3.159717416*	*0.607035547*	2
Making reporting mechanism	*3.171749526*	*1.986504895*	*0.385111848*	30
Creating and supporting creative and innovative thinking	*3.344368217*	*1.818328882*	*0.352205223*	38
Organizing cooperative relationship with contractors to create value	*3.510289568*	*1.625771457*	*0.316540526*	41
Investment on tangible and intangible assets	*2.918072685*	*2.220085741*	*0.432078102*	24
Cultural consistency and knowledge sharing	*2.945434024*	*2.221765362*	*0.429974769*	25
Cultural migration	*3.288956889*	*1.814779046*	*0.355578554*	36
Goals and objectives description for people	*2.794547952*	*2.341344829*	*0.455878837*	21
Organization's and individual's goals alignment	*2.314670371*	*2.847924465*	*0.551645937*	7
Quantitative difference between employees and managers	*3.245377971*	*1.929846166*	*0.372900983*	33
Making self confidence in employees	*2.995397668*	*2.141648125*	*0.416902673*	26
Respectful behavior with employees	*2.683604403*	*2.472482057*	*0.479526881*	16
Making recorded and documented structure	*2.41848647*	*2.769951131*	*0.53386999*	9
Defining employees' responsibilities and tasks	*2.557060149*	*2.605951801*	*0.504734799*	11
Identifying and removing structural obstacles	*3.008921535*	*2.139599486*	*0.415575556*	27
Identifying communicational obstacles by leaders	*3.071511944*	*2.077059189*	*0.403424394*	28
Decentralization in organizational decision makings	*2.386568258*	*2.75166726*	*0.535527663*	8

Fuzzy TOPSIS technique

Decision making process steps by fuzzy TOPSIS technique are shown below (Hwang and Yoon, 1981):

Step 1: calculating weights vector w~j

$$\tilde{R} = \left[\tilde{r}_{ij}\right]_{m\times n} \quad (1)$$

Normalizing the calculated matrix

$B \subseteq \{1,...,n\}$ is related to benefit-based indices and $C \subseteq \{1,...,n\}$ is related to cost-based indices.

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*}, \frac{d_{ij}}{d_j^*}\right), \quad j \in B \quad (2)$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{d_{ij}}, \frac{a^-}{c_{ij}}\ {}_j \frac{a^-}{b'_{ij}}\ \frac{a_j^-}{a_{ij}},\right) \quad {}^j j \in C \quad (3)$$

Step 2: so normalized weighted matrix is calculated as formula 4:

$$\tilde{V} = \left[\tilde{v}_{ij}\right]_{m\times n}, \quad i = 1,2,...,m, \ j = 1,2,...,n$$
$$\tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j \quad (4)$$

Step 3: determining the fuzzy positive ideal solution $\tilde{v}_j^*$ (FPIS) and fuzzy negative ideal solution $\tilde{v}_j^-$ (FNIS) (formulas 5, 6):

$$\tilde{v}_j^* = \begin{cases} \max\limits_{i=1,...,m} \tilde{v}_{ij}\ ; \ j \in B \\ \min\limits_{i=1,...,m} \tilde{v}_{ij}\ ; \ j \in C \end{cases} \quad (5)$$

$$\tilde{v}_j^- = \begin{cases} \min\limits_{i=1,...,m} \tilde{v}_{ij}\ ; \ j \in B \\ \max\limits_{i=1,...,m} \tilde{v}_{ij}\ ; \ j \in C \end{cases} \quad (6)$$

$$FNIS = \{\tilde{v}_j^- \mid j = 1,...,n\}$$
$$FPIS = \{\tilde{v}_j^* \mid j = 1,...,n\}$$

Step 4: calculating the alternatives from positive and negative ideal by applying formulas 7, 8 and 9:

$$D\left(\tilde{a},\tilde{b}\right) = \sqrt{\frac{1}{4}\left[\left(a_1-b_1\right)^2 + \left(a_2-b_2\right)^2 + \left(a_3-b_3\right)^2 + \left(a_4-b_4\right)^2\right]} \quad (7)$$

$$d_i^* = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^*), \ i = 1,...,m \quad (8)$$

$$d_i^- = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^-), \ i = 1,...,m \quad (9)$$

Step 5: Calculating the relative closeness to the ideal solution:

$$Cc_i = \frac{d_i^-}{d_i^- + d_i^+} \quad (10)$$

Fuzzy TOPSIS technique

In real world, because of incomplete and inaccessible information, data not only is not certainly; but also is almost fuzzy (Chen, 2000). In the current paper, we are trying to prioritize human resource productivity indices using fuzzy data.

To prioritize all HRP indices, fuzzy TOPSIS technique was used. Positive and negative ideal solution, closeness rate and final rank of variables are presented in table 4:

As table 4 shows "human resource management, planning and improvement", "Cooperating in supply chain for creating customers' added value" and "Evaluating methods for risk responsibilities" were elected as the top indices.

Conclusion and suggestions

The current paper with the purpose of influence of ICT on HRP was done in a society includes 52 managers of education and research organization- Tehran- Iran. First of all, by applying Chi-square test the relationship between ICT with HRP and its indices were proved. After that the results of applying Average test show that all variable apart from "creativity and innovation" were placed in favorable places. Finally by utilizing fuzzy TOPSIS technique HRP indices were ranked in which "human resource management, planning and improvement", "Cooperating in supply chain for creating customers' added value" and "Evaluating methods for risk responsibilities" were chosen as the most important sub criteria. Attending to the results the managers are advised to plan for their human resources accurately. Enhancing employees' payment and salaries, applying appropriate leadership style and designate employees' job in base of their skills, expertise and experience are other advises to achieve more human resource productivity.

References

[1] Alnani, M., Ahmadi, P., 2001, "deigning total management driving affecting factors on human resource productivity", Modarres quarterly, Vol. 5, No. 1.

[2] Chen, C.T., 2000, "Extension of the TOPSIS for Group Decision-making under Fuzzy Environment", Fuzzy Sets and Systems, No. 114, P. 1-9.

[3] Dulhan, S. L., Schuller, R. S., 1999, employees and human resource management, translated by Toosi, M. A., Saebi, M., public management publication center.

[4] Economic and Social Commission for Asia and the Pacific (ESCAP), 2001, "Are ICT Policies Addressing Gender Equality?"

[5] Haji Karimi, 'Abbas'ali, Rangriz, Hassan, 2000, human resource management, commercial publication, 1st edition, Tehran, Iran.

[6] Hwang, C. L. and Yoon, k., 1981, Multiple Attribute Decision Making: Methods and Applications, Berlin, Springer.

[7] Kiiski S. and Pohjola M. (2001). Cross-country diffusion of the Internet, available at http://www.wider.unu.edu/publications/dps/DP2001-11.pdf.

[8] Marcelle G. (2000). Gender, Justice and ICTs, available at: http://www.un.org/womenwatch/daw/csw/marcelle.htm.

[9] Nadler, D.A & Lawler, E.F, 1983, "Quality of Work of Work Life: Prespective & Direction", Organizational Dynamics

[10] Peak, D., Guynes, C. S., V. Kroon (2005). Information technology Alignment Planning—a case study. Information & Management. Vol 42, pp 619–633.

[11] Rodriguez F. and Wilson, E. (2000). "Are Poor Countries Losing the Information Revolution?", info Dev Working Paper, (Washington DC:World Bank).

[12] Shah Beygi, M. M., 1994, surveying the solution of improving productivity (case study: Gorgan Zamzam Co.), M. A dissertation, faculty of management and economy, Shahid Beheshti University.

[13] Sink, D. Scot, 1985, Productivity Management, John Wilhy & Sons

[14] Yaghoobi, Noor-Mohammad, Moloudi, Jamshid, Azadikhah, Omolbanin, 2011, The Relationship between Empowerment and Human Resource Productivity in Organization, journal of basic and applied scientific research, 1(10), 1603-1610.