A Multi Criterion- Approach and an Educational Comparative Need Assessment Based on the Analysis of Staffs' Competencies

Amir Farokhnejad[1,*], Bahram Fadaiyan[2]

[1]Persian Gulf University, Research Institute of Persian Gulf
[2]Educational administration, National Iranian Gas Company, Bushehr Province Gas Company
*Corresponding author: farokhnejad_shu@shyahoo.com

Abstract The aim of this paper is to assess the educational needs of staffs working in technical and operational deputy of Bushehr Oil Produces Distribution National Company (BOPDNC) along with a comparative/mixed approach. Objectives of this paper is focused on Executive Skills(ES),Interpersonal Skills (IS), Intellectual Essentials(IE), Personality Essentials(PE).The study population consisted of 143 staffs among which some of them were working in administrative and financial affairs and some of them were working in operational deputy known as middle managers. A none-random sampling was applied to conduct the requested model. Data were gathered via three questionnaires including staffs' competencies, paired comparisons of criterion and competency factors, and staffs' competencies and educational needs. Using AHP method could help to identify four key competencies of staffs including executive skills, interpersonal skills, intellectual essentials, and personality. Findings showed that the used AHP method could help to identify educational needs, increase in educational effectiveness, and increase in motivation of staffs' participation for need assessment and performing the educational plans. Since all today organizations are requested to prepare educational plans for improving their own staffs, the results of this paper, and of course, similar papers can be generalized for making professionally knowledge, skills, and attitudes develop.

Cite This Article: Amir Farokhnejad, and Bahram Fadaiyan, "A Multi Criterion- Approach and an Educational Comparative Need Assessment Based on the Analysis of Staffs' Competencies." *American Journal of Educational Research*, vol. 3, no. 7 (2015): 949-955. doi: 10.12691/education-3-7-20.

1. Introduction

Training and Human Resource Development (HRD) causes a deeper vision, higher knowledge, more skill and attitudes (KSAs) for any organization's staffs. Several experts believe that staffs' learning, apprenticeship and initiatives for performance development should begin with need assessment. It is required to have a good link of educational processes to organizational strategic needs and strategic goals; therefore, any general orientation and organization strategies are known as determinant variables in identifying the type and level of trainings delivered and the level of competencies and skills gained [7].

Zahid [10] has ranked some elements in evaluation of an organization's educational needs: top management decisions, supervisors' view, list of skills, staffs' surveying, analysis of servicing or business plans, customers' view, apprenticeship audits, working groups' request, outside consult, and consulting committee. His study confirmed that top management decision and supervisors' view could have the most rankings than the other elements. Also, it showed that although top management decision and supervisors' view were significant, using objective data and official methods could prepare a wider support for following up some ways of quality management.

Any real educational need points out the gap between existing behaviors and job tasks and what is important is the staffs' ability and skill in the organization and if they are defined accurately, individuals will be evaluated and then, accurate educational needs will be identified; however, designing such a framework by which three main factors of determining any need; namely, individual, job, and organization, must be simultaneously considered. Based on this approach, this paper is to make an accurate linkage between training and organization's goals and strategies, skills, knowledge and abilities for staffs' need to achieve strategic goals and be in rival conditions of business world. Such an attitude is so called known as comparative/mixed approach and multi-criterion for educational need assessment.

Competency is defined as the power, the ability, and the capacity to do any task according to Oxford Dictionary. Que stated the competency as the result of applying knowledge and skill appropriately. National Park Service Employees has announced that competency is a set of knowledge, skill and abilities in a specific job allowing any person achieve success in his/her task [8].

Byham [2,3] pointed out three steps for designing any developmental plans regarding the development of competency-based human resource systems which are designing of competency model, need assessment, and designing of educational plan.

A large number of organizations today are incurring more expenditures on training and development than they did earlier. With the growing concern and awareness for reason of training and development efforts, evaluation of training has become important to determine the effectiveness of such program [6].

Training requires lot of resources-time, money, equipment, materials, facilities, expertise- that could be used for other purposes. Even in tough economic times, although organizations may try to reduce costs by seeking more efficient base to train employees, they continue to invest in training activities [5]; accordingly, any company affiliated with the Oil Ministry in Iran is going to be in a competitive condition, so this paper believes that any organization's workforce is increasingly significant to get organizational success. Training is the basic element for achieving those requested goals. If any successful training is requested, the need assessment must be done accurately and systematically as well.

2. Methodology (Designing a Comparative/Mixed Approach of Educational Need Assessment)

To perform the comparative/mixed approach, staffs working in technical/operational units of BOPDNC were selected as study population; therefore, firstly for extraction a competency model, a list of criterions and variables of competency were identified which were assumed to be able to use in all levels of staffs and finally, based on competency theories, they were grouped into four main classes. The base of this grouping was originally built on the competency concept definition raised in the introduction part; consequently, the four

groups of criterion of the general competency have been considered respectively as following:

a) Executive skills, b) Interpersonal skills, c) Intellectual essentials, d) Personality essentials.

According to the existing literature of competency, several variables could be placed in the mentioned groups. Firstly, 18 variables which had more linkage with competency were selected, reviewed and refined through participation of university experts and experienced managers of that company. Thus, a questionnaire containing four key aspects was set up and was supposed to be applied as the criterion. Content validity and factor analysis were used to measure the validity and survey the interrelationship of the existing variables, shaping the criterion cluster, and required accreditation given to the questionnaire.

The existing variables of this paper were dispersed among criterions (or factors) based on theories and studies related to competency, so confirmatory factor analysis was conducted for all of the variables of any subdivision (See Table 1 for survey and description of any factor test for each criterion).

3. Findings

In comparative/mixed approach, the aim is to link and make the organizational goals and strategies widening educational needs during staffs' evaluation process. This is done using designing and utilizing the staffs' competency model. In fact, the linkage ring and core point of comparative/mixed approach is the staffs' general competencies. Some specific steps for having a comparative/mixed approach as following:

A) Identifying, accreditation, and extraction a model of staffs' general competencies

The first and the most significant step here is to determine the model of competency in organization e.g. those done by Clark [4], shown in Figure 1.
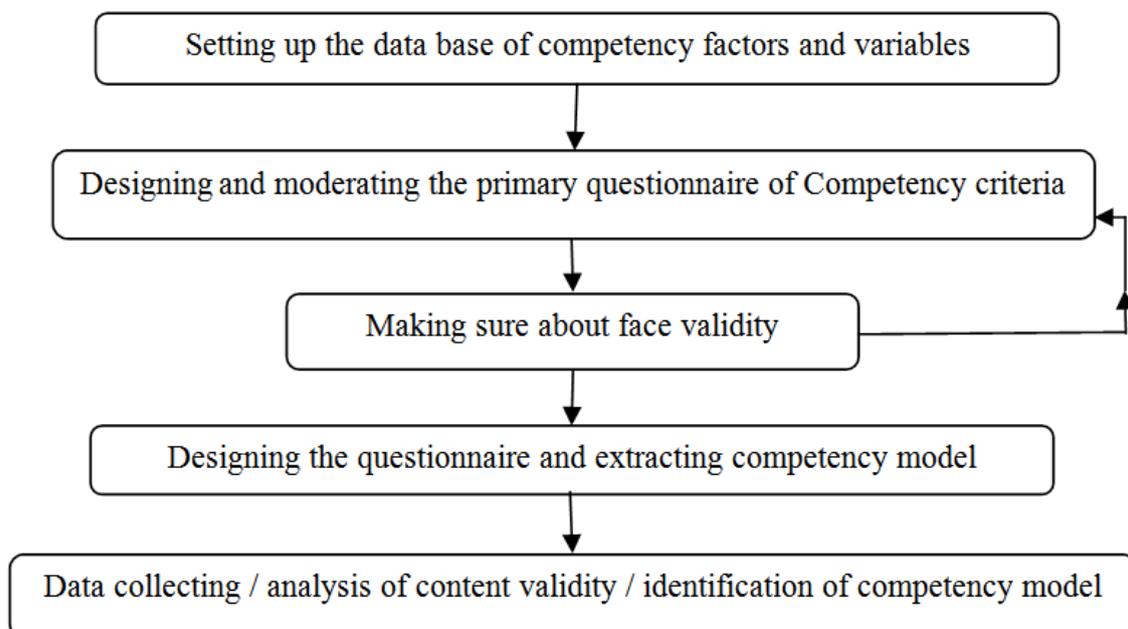

Figure 1. Activities related to identification, accreditation, and extracting model of staffs' general competency

Bartletts Test Spherecity and Kaiser-Meyer-Olkin's measure of sampling adequacy were used to measure validity and reliability of the competency model. It is worthy to be noted that as it will be discussed through next sections of this paper, statistical tests and tools were assumed adequate for extraction and wheeling of related factors since the company concentration was on confirmatory factor analysis and the applying of competency model.

B) Evaluation and ranking of staffs and managers based on AHP

An important point which must be considered is the weight difference (or the degree of significance) of finally selected competencies for employees' evaluation working in various sections (or different positions) in an organization which is performed through AHP (See Figure 2).
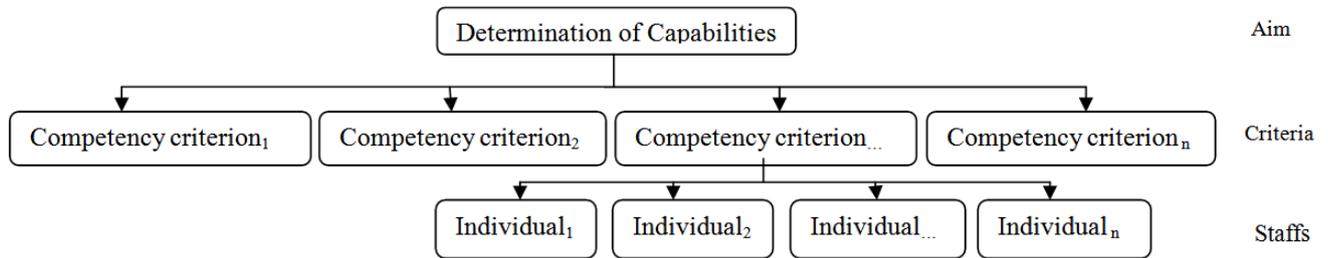

Figure 2. tree of hierarchical evaluation in AHP

In proposed comparative/mixed approach, as it is seen, the lowest level of evaluation process is based on evaluator's judgment (here is the experienced and skillful manager), and score (capabilities) of any person for any competency as a bipolar scale (as shown in Table 1) is calculated then the sum of any people's competency scores is multiplied by its weight (significance). The result will be the weighted mean of competencies related to individual person. Evaluation and ranking of staffs can be performed according to the resulted score.

C) Determining educational needs and identifying the needed educational courses

Appropriately educational needs must be predicted and determined to make accountability for organization's key competencies. Staffs' educational needs are consequently done in two stages:

1. Determining needs done by the evaluator;
2. Bench-marking from excellent people in the group of evaluated people based on the acquired rankings done by the evaluated ones.

Cronbach's Alpha was used to measure the reliability of the questionnaire ($\alpha=0.891$). The rest of Alphas can be seen in the Table 2.

Table 1. Results taken from the conducting of validity measurement tests of need assessment questionnaire

Variables	No. of questions	Indices and factor tests			No. of remaining variables
		KMO	Bartlett's	Exploratory cumulative variance	
Intellectual essentials	5	0.88	0.01	48.9	3
Personality	4	0.69	0.01	71.3	2
Interpersonal essentials	4	0.83	0.01	61.3	3
Executive skills	5	0.84	0.01	57.3	3

Table 2. Results taken from the conducting of reliability measurement tests of questionnaire

Cronbach's Alpha of various parts of the	Questionnaire criterions			
	Intellectual essentials	Personality	Interpersonal essentials	Executive skills
	0.802	0.869	0.891	0.878

To facilitate the performing of competency evaluation by direct evaluator, a separate questionnaire was designed and delivered to the evaluator (See Table 3 showing some items in brief).

Table 3. a sample of questionnaire used in competency evaluation

Evaluation of competencies and identification of needs											
Excellent		More than exp.		Expected		Less than exp.		Weak		Evaluation	Decision-making Factor
10	9	8	7	6	5	4	3	2	1		
Ability to identify, analysis (problem solving), evaluation for tactics, risks(risk taking), and solving job and managerial problems and taking appropriate decision and instant reaction and attention to important and critical issues (power and decisiveness in decision making)										Improvement opportunities	
										…	…
Excellent		More than exp.		Expected		Less than exp.		Weak		Evaluation	Factor of Professional skills
10	9	8	7	6	5	4	3	2	1		
Having able to utilize any needed professional skills for optimizing job tasks according to appropriate speed and quality										Improvement opportunities	
Please write down any required professional skills related to competencies, educational needs, or improvement opportunities in the performance of any evaluated individual. 1-……………………………………..2-…………………………………….3-………………………………..4-…………………………….. 5-…………………………………………6-……………………………………...7-…………………………..8-…………………………											

AHP was applied to make ranking and selection of excellent people regarding each of competencies. To understand this process more, a tree of hierarchical evaluation of competencies was determined as shown in Figure 3.
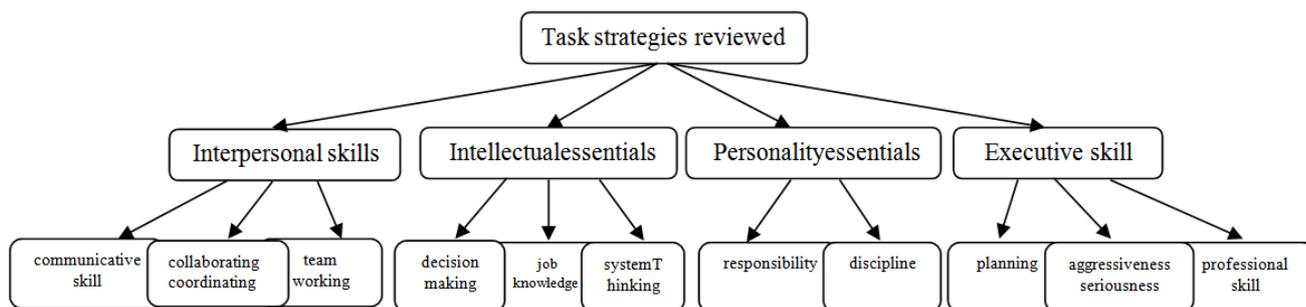

Figure 3. tree of hierarchical evaluation of competency

As it is seen, the lowest level refers to the significance degree of any factors related to subdivision of competency criterions. In the middle level, a matrix of paired comparisons has been set and the evaluator has been asked to determine the relative preference of those factors based on Saatiscale (See Table 4).

Table 4. PCM of subdivision factors of criterion related to executive skills in AHP

Factors	Planning	Discipline	Technical Skill
Planning	1	0.111	0.333
Discipline	9	1	4
Technical Skill	3	0.25	1

As it is understood, this matrix is vice versa one, e.g. No. 4 (line 2 and column 3) shows that factor discipline is a subdivision of executive skills having for times preference than the other existing factor in this criterion; namely, technical skill.

According to AHP, this matrix must be normalized primarily to calculate the weight of indices for any PCM if it has a required adjustment. To do that, individual factors existing in the column of PCM must be divided by the sum of that column (or by the maximum existing number in that column) (As shown in Table 5).

Table 5. Normal matrix for subdivision factors of criterion related to executive skills in AHP

Factors	Planning	Discipline	Technical Skill
Planning	0.077	0.082	0.062
Discipline	0.692	0.735	0.750
Technical Skill	0.231	0.184	0.188

Now, if the mean of the mentioned normalized matrix is taken, the resulted numbers show the weights of lines (surveyed factors in PCM). Calculated weights are shown in Table 6.

Table 6. Calculated weights for subdivision factors of criterion related to executive skills in AHP

Factors	Weight
Planning	(0.077+0.082+0.062)/3=0.074
Discipline	(0.692+0.735+0.75)/3=0.726
Technical Skill	(0.231+0.184+0.188)/3=0.201
Sum	1

Competency criterions will be placed on the top level where competency criterions are evenly compared and weighted. Here, task strategies will be a criterion for each related unit's comparison e.g. operational and technical deputy unit. A survey of four competency criterions of this paper has been done by an experienced evaluator and the results are shown in Table 7.

Table 7. PCM of competency criterions in Technical / Operational Unit

Criterions	Intellectual Essentials	Interpersonal Essentials	Executive Skills	Personality
Intellectual Essentials	1	1	1	1
Interpersonal Essentials	1	1	0.5	1
Executive Skills	1	2	1	2
Personality	1	1	0.5	1

According to AHP technique, a researcher must be sure about the adjustment, comparisons done by an elite evaluator (evaluator of significance degree) before performing any calculation related to weight extraction. PCM of competency criterions and its subdivision factors related to non-adjustment are shown in Table 8.

Table 8. Rate of non-adjustment related to PCM among operational/technical staffs

Rate of non-adjustment of competency criterions in hierarchical tree				
Main criterions of competency	Factor of intellectual essentials	Factor of personality	Factor of communicative skill	Factor of executive skill
0.54	0.0014	0.000	0.001	0.008

A sample of calculations related to normal matrix in the level of model criterions is shown in Table 9. As it is seen, the sum of resulted weights will be necessarily equal with 1.

Calculated weights about subdivision factors of each competency criterions are shown in Table 10. It is worthy to be noted that significance degrees are not necessarily equal with the other staff or operational units or about the other organization job ranks (e.g. ordinal staffs); therefore, the procedure of calculations for competency weights of each defined set of staffs must be performed from the first step to the last one.

Table 9. Normal matrix and final s of PCM among operational/technical staffs

Criterions	Intellectual Essentials	Interpersonal Skill	Executive Skill	Personality	Weight
Intellectual Essentials	0.25	0.20	0.33	0.20	0.246
Interpersonal Skill	0.25	0.20	0.17	0.20	0.204
Executive Skill	0.25	0.40	0.33	0.40	0.346
Personality	0.25	0.20	0.17	0.20	0.204

Table 10. Calculated weights about subdivision factors of each competency criterions

Criterion of Intellectual Essentials			
Sub. Factors	Decision making	Job Knowledge	System Thinking	Sum of Weights
Sig. Degree	0.185	0.733	0.082	1
Criterion of Interpersonal Collaborations			
Subd. Factors	Communicative Skill	Coordinating/collaborating	Group work	Sum of Weights
Sig. Degree	0.182	0.727	0.091	1
Criterion of Executive Skills			
Subd. Factors	Discipline	Planning	Professional skill	Sum of Weights
Sig. Degree	0.726	0.704	0.21	1
Criterion of Personality Essentials			
Subd. Factors	Taking responsibility	Aggressiveness / Seriousness	Sum of Weights
Sig. Degree	0.875	0.125	1

The results from individuals' evaluation in evaluation questionnaire has been placed in decision matrix related to subdivision factors of executive skills criterion and then, based on normalizing rules, each element has been divided by its related column to make Table 11 be calculated.

The calculated numerical rankings for individuals are equally merged to make the new individuals' ranking identifiable (as shown in Table 12). The last column of this table shows the general and final rankings for surveyed persons.

Table 11. Normal Matrix of Individuals' Evaluation in Executive Skill Competency

Individuals	Subdivision Factors			Evaluated Individual's Rank
	Discipline	Planning	Professional skill	
A	0.258	0.238	0.222	0.249
B	0.323	0.333	0.370	0.333
C	0.258	0.238	0.222	0.249
D	0.161	0.190	0.185	0.168
Factor Weight	0.726	0.074	0.2	-

Table 12. Calculations of Individuals' Final Ranking in Normal Matrix for individuals' Evaluation of Competencies

Individuals	Competency Criterions				Final Rank
	Intellectual Essentials	Personality	Interpersonal Skills	Executive Skills	
B	0.322	0.267	0.287	0.333	0.308
C	0.234	0.272	0.269	0.249	0.254
A	0.238	0.277	0.254	0.249	0.253
D	0.205	0.183	0.191	0.168	0.185
Factor Weight	0.246	0.204	0.204	0.346	-

According to the resulted rankings, selection of excellent individuals can be done in each competency regarding general competencies. Table 13 shows the results of ranking calculations and prioritizing of evaluated individuals.

Table 13. Final Ranking for' Evaluated Individuals based on Competency Criterions

Rank	Competencies			
	Intellectual Essentials	Personality	Interpersonal Skills	Executive Skills
1	B	A	B	B
2	A	C	C	C
3	C	B	A	A
4	D	D	D	D

The averages of balanced scores in competencies are used as a criterion for measuring competency gap (as shown in Table 14 based on AHP) for 4 technical managers. It is clear that evaluation result in gap was calculated based on a bipolar scale from zero to ten.

Table 14. Mean of Balanced Scores for Competencies for operational/Technical Managers

Individuals	Mean of Balanced Scores of Evaluated Individuals in Competency Criterions				Final Balanced Score
	Intellectual Essentials	Personality	Interpersonal Skills	Executive Skills	
A	5.33	6.00	6.33	6.33	6.22
B	6.67	6.00	7.00	9.00	7.41
C	5.33	6.50	5.67	6.33	5.98
D	5.00	4.50	4.67	4.67	4.72
Criterion Weight	0.246	0.204	0.204	0.346	-

To analyze this gap, it is adequate to draw and examine the existing conditions of Manager A's capabilities for the mean of competency scores related to technical/operational managers along with the gained scores by excellent individuals in each competency. Figure 4 will show the mentioned gap for Manager A.
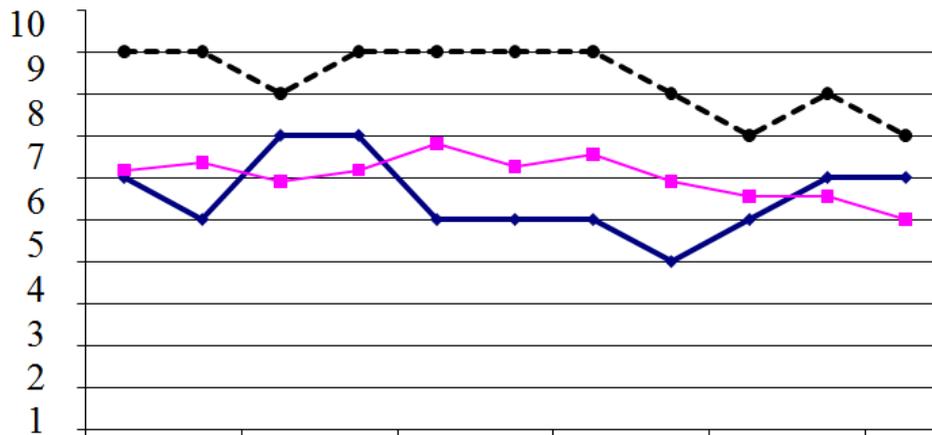

Figure 4. Gap Analysis for identifying educational needs having priority for evaluated person known as A

As it is shown in Figure 4, gained scores by individual A has not been as to what it is expected e.g. in some factors such as following:

1) Aggressiveness and Seriousness (AS); 2) Taking Responsibility (TR); 3) Professional Skill (PS); 4) Planning (P); 5) Discipline (D); 6) Group Working (GW); 7) Collaborating & Coordinating (CC); 8) Communicative Skills (CS); 9) System Thinking (ST); 10) Job Knowledge (JK);11) Decision Making (DM).

Table 15 will show the related action for individual A briefly.

Table 15. Extraction of educationally preferable needs for technical Manager A based on gap analysis and benchmarking from excellent individuals

Educational recommendations	Reference for education identification	Improvement opportunities based on evaluator's view	Factor	Score out of 10	Criterion
System Thinking course, problem solving, hidden resources in systems are key for problem solving	BB	Power for analysis and understanding of continuity among issues	System Thinking	5.33	Intellectual essentials
Strategic Thinking course, technology management, process management		Segmentation in viewing issues			
Communicative skills courses, self development and others, managing people and technical organization , forming effective teams		Team making and net making	Group work	6.33	Interpersonal Skills
Course of Making affect on others, sessions management		Passive in group activities	Coordinating and collaborating		
Course of making others content, group working for problem solving, human and organizational communications		Ability to gain any agreement			
Course of specialized and professional skills development, staffing courses, human resources courses		Speed in action and quality in doing affairs	Professional skill	6.33	Executive Skills
Courses of project management e.g. oil, gas, petrochemical, productivity, maintenance, becoming familiar with shaping polymers and producible items from petrochemical products		Concentration on major responsibilities			
Distribution requirement planning, management on waste decrease		Prediction of job issues	Planning		
Course of strategic change, strategic management for middle managers		Prediction of job issues, strategic planning			

4. Discussion and Conclusion

In the proposed comparative/mixed model, Balanced Score Card (BSC) model was primarily used to design and accredit a general model of staffs' competencies in one of zones affiliated with BOPDNC. Then, identifying the weights of model criterion, evaluation and ranking of staffs (managers in technical/operational sections) are shaped based on various indices of competency, and finally, preferable needs and according to it, related educational plans were defined based on idea measuring of those individuals having had higher ranks among evaluated ones about their competencies. To measure the accuracy and validity of need assessment process, it is compulsory to have experimental criterions resulted from planning and performing educational courses though its access was excluded out regarding time duration of this paper, but regarding behavioral reactions and gained feed-backs from individuals having been present in the process of need identification, it sounds that the proposed way was acceptable generally regarding strategic record of BOPDNC and furthermore, gaining some benefits such as more accurate identification of educational needs, increase in educational effectiveness, being applicable educations, and increase motivation of staffs' participation in the light of proposed need assessment process will be expected more and more by the company's practitioners.

Although it lasts three decades of applying competency approach for designing educational courses in evaluation and development centers, concerning a competency model as a multi-criteria issue (in an AHP framework), and ranking of items for evaluation based on AHP and bench marking of excellent individuals in competency for determining requested educational needs will be considered as innovations of this paper.

Also, the mentioned model is really a comparativeness of educational need assessment attitudes related to individual, job, and organization since , firstly, competency criterions and their subdivision factors have adequate comprehensiveness for coverage the factors related to job, and the individual, and secondly, extraction a competency model have been shaped based on analysis of strategic situation and organization's strategic orientation.

A multi-criteria attitude in a comparative model proposed in this paper (and even future one) can be developed though using the other techniques in multi-index decision making. Applying a comparative/mixedmodel can bring up more motivation and eagerness of staffs for their participation in need assessment process and related educational designing, and increasing in belonging towards the meritocratic selection of referent individual in evaluation groups.

Knowledge, skills, and attitudes are the three criteria around which all jobs are based. A training need is a gap between knowledge, skills, and attitudes desired and already possessed by the employees; therefore, carefully planned and conducted training and development efforts help employees to achieve goals through higher levels of skills and competencies. Furthermore, training develops individuals and teams for meet the changing needs of the organizations. As Pande [9] states training is an investment in Human Resources with a promise of better returns in future and it results in greater stability, flexibility, and capacity for growth in an organization; meanwhile, Bhatia [1] emphasizes on that future needs of employees and organizations are met through development programs.

Finally, the authors believe that for making an organization become successful, the following items should be observed:

Management to commit itself to allocate major resources and adequate time to training;

Establishment a systematic training and development plan and process;

Determination of organization's objectives and strategies;

Assessment of training needs;

Continuity of Training and re-training at all in company;

Setting up a proper linkage among organizational, operational, and individual training needs.

References

[1] Bhatia, S.K. (2009). Training and Development: Concepts and Practices. Mayapauri, Phase 1, New Delhi.

[2] Byham, W. (2002). Developing dimension of competency-based human resource systems. Canada: DDI.

[3] Byham, W., & Moyer, M.(2002). Rising competencies to build a successful organization, Canada: DDI.

[4] Clark, D. (2005). Discussion Competencies. Available at: http://www.nwlink.com

[5] Chan, J.F. (2010). Training Fundamentals: Pfeiffer Essentials Guides To Training Basics. John Wiley and Sons, Inc.

[6] Fee, K. (2009). Delivering e-learning: A complete strategy for design, application and assessment. London: Cogan-Page.

[7] Karami, M. (2007). Managers Education with Competency Model. *Tadbir Quarterly*, Vol. 18, No. 179.

[8] Parhizgar, K. (2010). Comparative ethical analysis of educational competition in academia. *Competetiveness Review: An International Business Journal*, Vol.20, No.1, p.72-84.

[9] Pande, A. (2005). Perspective on Training Need Assessment: Training and management. New Delhi.

[10] Zahid, I.M. (2011). The growing concept and uses of training needs assessment: A review with proposed Model. *Journal of European Industrial training*, Vol.35, No.5.