

Study The Relationship Between Emotional Intelligence Of The Managers And Their Entrepreneurial Personality In Air-Handling Units And Industrial Diffusers Manufacturers With Using Artificial Neural Network

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Abstract: The aim of this research is the study the relationship between emotional intelligence of the levels of managers (senior managers, middle managers and operational managers) on their entrepreneurial personality in Tehran province air-handling units and industrial diffusers manufacturers in the country of Iran with using artificial neural networks. The volume of the statistical society for each one of these three groups is 81, 183 and 430. The sampling method in this research is Stratified random method. With using the Cochran formula the sample size for each one of these three groups is 58, 95 and 135. It is used from the regression model and Neural Networks model for test of assumption. The results of this research has clarified that the factors of the emotional for the managers of senior and operational levels and their entrepreneurial personality have positive and meaningful relation (The Coefficient Of Correlation in sequence is 0.537 & 0.725) but there is no positive and meaningful relations between emotional intelligence for the managers of middle levels and their entrepreneurial personality. The findings also showed that the neural network approach is better than linear regression for predicting this relationship.

Index Terms: Emotional Intelligence, Entrepreneurial Personality, Air-handling units and industrial valves Manufacturers, Self Awareness, Self Management, Social Awareness, Relationship Management, Neural Networks

1 INTRODUCTION

WHIT consideration to this matter that entrepreneurship and its related topics in different fields of sciences such as psychology and economy have been investigated, entrepreneurship could be considered as an interfiled subject. This matter will show the expanse of the topic of the entrepreneurship in one hand and its complexity in the other hand. (Arabi, 2003) "Mc Clelland" has presented the theory of relations between individual features and the improvement of the economy in the occupational fields and has been found out that the improvement is not depended to a specific religion and with improving and developing of some features in the people, improvement of the economy could be available in different society.(Mc Clelland, 1998) Therefore the most important factor in entrepreneurship is the personality of the entrepreneur person. (Drissen, Zwart, 1997) the entrepreneurial personality of each person is under influences of many variables.

The researchers in most of the sciences have investigated on the nature of the human to know why people sometimes will do something that have no logics and reasons.(Goleman, 2003) In this regard many researches have been done which show us some other factors are effective; the people who have a very high level of intelligence were not very successful, but the people who have a very normal level of intelligence are more successful than the mentioned group of people. These factors will include other aspect of success that the "Goleman" named it as emotional intelligence. Emotional Intelligence is ability of recognition of meaning of emotions and its relations and reasons and solving the problems. (Mayer and others,1990). "Goleman" believes that the Emotional Intelligence is ability of recognition, understanding and adjusting the emotions and using them in the life that will cause of exiting the people and using their emotions in their relations with the other peoples. "Robbins" believes that nowadays for improving the performances of the organizations, it could be used the knowledge of emotions and feelings (Robbins, 2010). Also in the point of view of "Mont and others" the abilities of emotional intelligence in the workplace has a very important role. (Aghayari & S.Daramadi, 2006) Using the emotional intelligence in the workplace means finding more skills for understanding the presence of the emotions in different situations, better controlling of emotions and letting to oneself for doing new actions and behavior in order to reaching more improvement. (Bradbury and others,2007) The researches of the creative leading center showed that primary reasons for inability of the managers in higher levels for controlling their organizations is not to having emotional abilities; the researches showed that the entrepreneurial personality of the people are under influences of emotional intelligence parameters (Hadizadeh and others, 1999), therefore emotional intelligence has not a ignorable effects on the success and controlling the organizations. With study the air-handling units and industrial diffusers

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manufacturers in Iran, this matter is clarified that these companies have a outstanding share in the capital market of the country and are included of those companies which have been improved very well. (www.irbourse.com) these companies because having lots of subsections and being sensitive of each one of these subsections, have a very important and outstanding situation and position in entrepreneurship of the country. Now the most important question is that if the emotional intelligence has any effects on the improvement of the entrepreneurial personality of the managers of these companies and finally is cause of succession of them or not. With consideration to these points and in order to investigation to the topic of psychological features of the entrepreneurs that will cause of their differences from the other entrepreneurs, this research is going to study the relations of the emotional intelligence variables with the personality of the entrepreneurs of the air-handling units and industrial diffusers manufacturers.

2 LITERATURE REVIEW

The researches which are related to the emotional intelligence: "Bratton and colleagues" (2010) have showed that the relations between emotional intelligence and performance of the leader among the managers who do not accept their abilities is more stronger. "Samad" (2009) has showed that all the aspects of emotional intelligence has meaningful relations with effective leading and in addition with that "social skills" as most important factor in effective leading, also it shows that there is outstanding differences about the range of emotional intelligence between the managers of senior levels and middle levels of organization. "Barry" and "Plessis" (2007) have studied the abilities which are required for the managers in engineering projects in the 21st century. The results of the analysis showed that almost 90% of the repliers have the same ideas that the emotional intelligence is vital for the project managers and the structure of four emotional intelligence factors (Self awareness, Self management, and Social awareness and Relationship management) for the project managers specially in the 21st century has the most applications. Jouibar (2006) has showed that the emotional intelligence among the managers of different levels is varied and this variation in the meaningful level is 5%. "Boyatzis" and "Retti" (2003) have showed that the emotional intelligence has the prediction role in effect of leadership and management in different type of Italian organizations. The researches which are related to the entrepreneurial personality: "Zhang" and "Bruning" (2011) have showed that the personality features of the entrepreneurs have the mutual and important effect on the performances of the companies. "Analoui and others" (2009) have studied the governmental managers of Islamic Republic of Iran. The results show that there are direct relation between managers' features and organizational entrepreneurship. "Frank and others" (2007) have studied the importance of the personality features in goals in the beginning of the work and successes. They found out that the personality features have meaningful and important effects on the decisions and goals to start a new work. Also the results showed them that the successes of the people have features that are different with the others. The researches which are related to the entrepreneurial personality and emotional intelligence: Their results obviously and clearly showed that there are meaningful and positive relation between entrepreneurial personality and emotional

intelligence. "Kamal" and "Kumar" (2013) showed that Current and future entrepreneurs with emotional intelligence can extend their leadership skills. "Ghorbani and others" (2012) examined the benefits of emotional intelligence and empathy in entrepreneurship. "Zuperka" and "Zakarevicius" (2010) showed that emotional intelligence features including self awareness, self management, social awareness and relations management on the personality features including need to success, internal control, Tendency to risk and self confidence in the person for entrepreneurship is very important. "Hadzadeh and others" (2009) have studied the relations between entrepreneurial personality and emotional intelligence in the dependent organizations of the Iran National Oil company. The outcomes, showed the powerful and positive relation between two variables of the entrepreneurial personality and emotional intelligence ($r=0.773$, $p<0.01$). "Zampetakis and others" (2009) showed that when the employers have high level of emotional intelligence, they will feel high level of success and it will cause of increasing the entrepreneurial personality. "Tomczyk and others" (2009) found out that high level of emotional intelligence of entrepreneurs will be cause of better workplace for the employers of these entrepreneurs. "Zampetakis" and "others" (2008) have expressed that there are positive relation among the emotional intelligence, creation, being hyper, attitude to entrepreneurship and tendency to entrepreneurship. "Rhee" and "White" (2007) found out that there are 18 qualifications among the entrepreneurs which are related to the emotional intelligence the most important of them in the field of the investment is very important. "Maghsoudi and others" (2005) the personality and psychology features (Emotional Intelligence, Creation, self image, self productivity and source of control) of entrepreneurs in Tehran with ordinary persons. "Cross" and "Travaglione" (2003) have showed that the most famous and important entrepreneurs has the highest level of emotional intelligence rather than the others and have emphasized that the researchers must to follow that in their studies about the entrepreneurship and in the 21st century the definition of the emotional intelligence must be presented.

3 ARTIFICIAL NEURAL NETWORK

An artificial neural network based on some simple neurons has been established that the neurons in layers by weights and activation functions are organized and linked together. Based on the weighted connections, A neural network is consistent of supervised or unsupervised training. In supervised learning, the learning data is measured with a target vector for adjusting weights, however, unsupervised learning, no target vector is unknown. The most famous model of supervised learning neural networks is back propagation. This model is widely used. A BP neural network includes an input layer, one or more hidden layers (middle) and an output layer. Figure 1 shows a BP network with three layers. (Menhaj,2001)

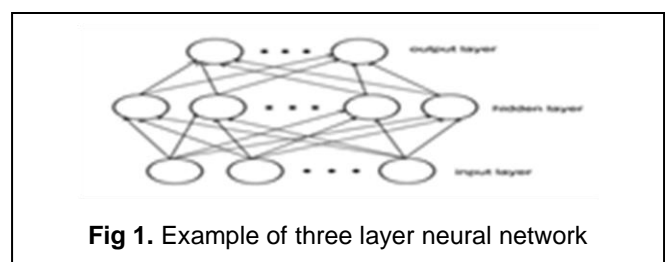


Fig 1. Example of three layer neural network

For BP network learning is used the Gradient descent algorithm. BP network learning involves the following steps:

First step: determining the initial weights between layers of neural network

Second step: Selecting the table of neural network learning

Third step: adjusting the Learning rate, momentum and Epoch of the network.

Fourth step: Repeat the procedure to achieve the desired or acceptable mean square error, which includes the following steps:

1. Calculate the output of each hidden node
2. Calculate the output of each output node
3. Calculate the error between target output and network output
4. Calculate deformation gradient for each output node
5. Calculate deformation gradient for each hidden node
6. Change in weight between output layer and hidden layer
7. Change in weight between the hidden layer and input layer

3.1 Activation function

Different activation function of neural networks to achieve the best design for the desired neural network is used. Usually symmetric activation function in different neural networks are better, such as hyperbolic tangent function that can be named that activation of neurons as a function of BP neural network is used.

3.2 Initialization

For paChoice of initial weights and bias values of random numbers with uniform distribution is in a small area between [-0.5 0.5] or [-1 1]. The number of hidden layer neurons: For a network that generalizes well should the number of adjustable parameters of the network be less than the number of learning data. So the number of hidden layer neurons should be selected in such way that the network parameters are not more than data learning. In theory, there is no restriction on the number of neurons in the hidden layer. But rarely is seen that this number does not exceed double the number of input nodes. (Zhang,1998) However, assigning the number of neurons in the hidden layer is generally chosen by trial and error. As a general principle in all matters is to try to use the simplest neural network model that adequately represents the learning data. In other words, it is clearer when a network is easier never to use a neural network may be larger. (Menhaj,2001)

4 METHODOLOGY

Present research could be classified according to the researches which are as their method of data classifications and this research could be type of explanation-evaluation, because in this research the study of the researcher has made no changes in the variables and just the present situation is studied. Also with consideration to the classification of the studies in the goals point of view, the present research will be classified as applied research. In this research the study of correlation method is used that in accordance with that the range of changes in one or more factor in effect of one or more

other factor will be studied. All the managers of the air-handling units and industrial diffusers manufacturers are member of statistical society of this research; Also if statistical society divided into three sections of senior, middle and operational level of managers. The volume of this society for each section is 81, 183 and 430. The method of sampling in this research is stratified random. With using the Cochran formula the sample size of all three sections of senior, middle and operational level of managers is 58, 95 and 135. The tools for gathering of the information and data is the questionnaire in this research, in this research with using the questionnaire the Emotional Competence Inventory (ECI) "Goleman and others" and standard questionnaire of the entrepreneurial personality "Kordnaeich" the needed data for statistical society have been gathered.

5 ANALYSIS OF THE RESEARCH

5.1 Study the Relationship between dimension of Emotional Intelligence and Entrepreneurial Personality

In this section study the relationship between dimensions of emotional intelligence and entrepreneurial personality of the managers are discussed and if the relationship between individual dimensions of emotional intelligence and entrepreneurial personality of managers are proven, finding a model that clearly shows the relationship between the whole dimensions of emotional intelligence and entrepreneurial personality are discussed.

5.1.1 Relationship between Self-awareness and Entrepreneurial Personality

According to the significant level of constant, significant level of coefficient and significant level of model in Table 1 are all less than 0.05 it could be expressed with 95% confidence that with increasing the self-awareness in the managers the entrepreneurial personality will be increased. Also $R^2=0.048$ shows that 4.8% of the variation in the dependent variable "entrepreneurial personality" by the independent variable "self-awareness" is covered.

TABLE 1

RELATIONSHIP BETWEEN SELF-MANAGEMENT OF MANAGERS AND THEIR ENTREPRENEURIAL PERSONALITY

Kind of causal relationship	dependent variable	independent variable
Positive relationship	Entrepreneurial personality	self-awareness

significant level of model	significant level of coefficient	significant level of constant	R^2
$0.000 \leq 0.05$	$0.000 \leq 0.05$	$0.000 \leq 0.05$	0.048

5.1.2 Relationship between Self-management and Entrepreneurial Personality

According to the significant level of constant, significant level of coefficient and significant level of model in Table 2 are all less than 0.05 it could be expressed with 95% confidence that with increasing the self-management in the managers the entrepreneurial personality will be increased. Also $R^2=0.087$ shows that 8.7% of the variation in the dependent variable "entrepreneurial personality" by the independent variable "self-

management" is covered.

TABLE 2

RELATIONSHIP BETWEEN SELF-MANAGEMENT OF MANAGERS AND THEIR ENTREPRENEURIAL PERSONALITY

significant level of model	significant level of coefficient	significant level of constant	R ²
0.000≤0.05	0.000≤0.05	0.000≤0.05	0.087
Kind of causal relationship	dependent variable	independent variable	
Positive relationship	Entrepreneurial personality	self-management	

5.1.3 Relationship between Social Awareness and Entrepreneurial Personality

According to the significant level of constant, significant level of coefficient and significant level of model in Table 3 are all less than 0.05 it could be expressed with 95% confidence that with increasing the social awareness in the managers the entrepreneurial personality will be increased. Also R²=0.099 shows that 9.9% of the variation in the dependent variable "entrepreneurial personality" by the independent variable "social awareness" is covered.

TABLE 3

RELATIONSHIP BETWEEN SOCIAL AWARENESS OF MANAGERS AND THEIR ENTREPRENEURIAL PERSONALITY

significant level of model	significant level of coefficient	significant level of constant	R ²
0.000≤0.05	0.000≤0.05	0.000≤0.05	0.099
Kind of causal relationship	dependent variable	independent variable	
Positive relationship	Entrepreneurial personality	Social awareness	

5.1.4 Relationship between Relationship-Management and Entrepreneurial Personality

According to the significant level of constant, significant level of coefficient and significant level of model in Table 4 are all less than 0.05 it could be expressed with 95% confidence that with increasing the relationship management in the managers the entrepreneurial personality will be increased. Also R²=0.080 shows that 8% of the variation in the dependent variable "entrepreneurial personality" by the independent variable "relationship management" is covered.

TABLE 4

RELATIONSHIP BETWEEN RELATIONSHIP-MANAGEMENT OF MANAGERS AND THEIR ENTREPRENEURIAL PERSONALITY

significant level of model	significant level of coefficient	significant level of constant	R ²
0.000≤0.05	0.000≤0.05	0.000≤0.05	0.080
Kind of causal relationship	dependent variable	independent variable	
Positive relationship	Entrepreneurial personality	Relationship management	

5.2 Study the relationship between dimensions of Emotional Intelligence and Entrepreneurial Personality Using the linear Regression

In Table 5, significant level of constant and significant level of model are less than 0.05. At the significant level of coefficient only variables social-awareness and relationship-management are less than 0.05 and the others are greater than 0.05.

TABLE 5

RELATIONSHIP BETWEEN DIMENSIONS OF EMOTIONAL INTELLIGENCE OF MANAGERS AND THEIR ENTREPRENEURIAL PERSONALITY

Mean of Squared Error	significant level of model	significant level of coefficient
0.185	0.000≤0.05	0.151≥0.05
		0.452≥0.05
		0.001≤0.05
		0.005≤0.05

significant level of constant	R ²	Kind of causal relationship	dependent variable	Independent variable
0.000≤0.05	0.154	Positive relationship	Entrepreneurial Personality	Self-awareness
		Positive relationship		Self-management
		Positive relationship		Social Awareness
		Positive relationship		Relationship - Management

So the linear regression equation developed in the 95% level is not reliable. Also R²=0.154 shows that 15.4% of the variation in the dependent variable "entrepreneurial personality" by the independent variables "self-awareness, Self-management, social awareness and relationship management" will be covered. In this relationship the mean square error is 0.185.

5.3 Study the relationship between dimensions of Emotional Intelligence and Entrepreneurial Personality Using the Artificial Neural Network

For the study of artificial neural network model is used back propagation (BP), the selected network has three layers that input layer consists of 4 neurons (the number of dimensions of emotional intelligence). The output layer consists of one neuron (entrepreneurial personality). The number of hidden layer neurons is optional but the research literature suggests that these neurons are better shouldn't be greater than twice the number of input layer neurons (in this research 8). Therefore network with the number of neurons in hidden layer 1 to 8 were tested and it was found that sum of the error squares in 6 and 8 neurons in the hidden layer are less than 0/05. Thus according to principle of saving for the number of neurons for the hidden layer is selected 6. Furthermore with study the transfer function of BP neural network for efficient transfer function of the hidden layer and output layer neural network is selected the hyperbolic tangent function. The developed neural network 70% of the data for training, 15% for testing and 15% for validation were selected. The maximum number of repetitions for training the network was considered 1000 repeats. If the network training during the next six replicates total mean square error becomes greater, the network will stop. As Figure 2 shows the sum of squared errors for the selected network is 0.0399. Figure 3 shows the Changes in the mean square error of the network for training, validation and testing. In this figure, the best network error is shown with a dashed line and figure 4 shows the correlation between test data, validation and training with their value of target by regression analysis.

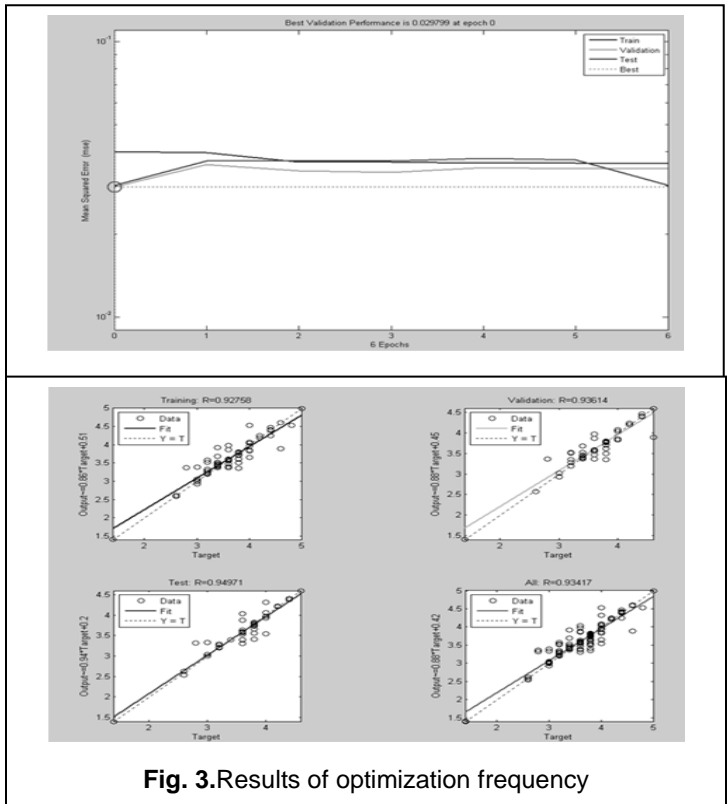


Fig. 3. Results of optimization frequency

5.4 Comparing the results of linear regression and neural networks

As Table 6 shows the mean of square error for neural networks is less than the linear regression and it means that the designed neural network is able to show the relationship between emotional intelligence of managers and their entrepreneurial personality better than the linear regression, so the designed neural network can predict the relationship between the dimensions of emotional intelligence of managers and their entrepreneurial personality with an error of less than 0.05.

TABLE 6
COMPARING THE MEAN OF SQUARE ERROR OF REGRESSION LINEAR AND NEURAL

	Linear Regression	Neural Network
Mean of Square Error	0.185	0.0399

6 SUMMARY AND CONCLUDING REMARKS

In this study, result of the regression model and the artificial neural network model for the study the relationship between dimensions of emotional intelligence and entrepreneurial personality were investigated. The result of the study shows that the neural network can predict the entrepreneurial personality of managers better than the linear regression. Due to the use of other statistical functions to study the relationship between dimensions of emotional intelligence and entrepreneurial personality are very time consuming and have complicated calculations so using neural networks to study the relationship between emotional intelligence of managers and their entrepreneurial personality are suggested. The results of this research show the positive and meaningful relation

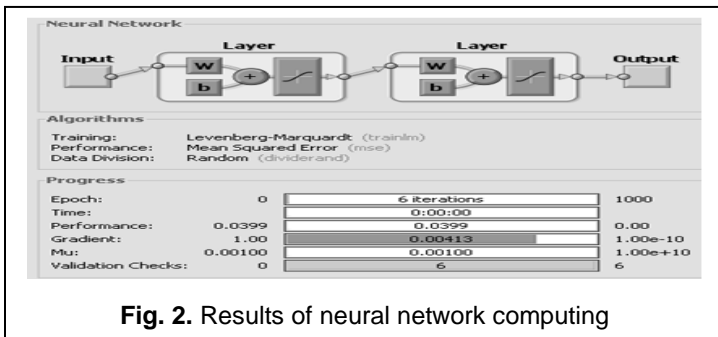


Fig. 2. Results of neural network computing

between emotional intelligence and entrepreneurial personality in air-handling units and industrial diffusers manufacturers. The results of the research in air-handling units and industrial diffusers manufacturers shows that whatsoever the managers know their emotions and feelings and are able to better adjust their internal and external behaviors and to motivate themselves to reach better goals and to show better reaction against the others behaviors and finally have a good dominance on their relations and to manage better their relations with the other guys, they have more emotional intelligence that this will cause of improving of the entrepreneurial personality. With consideration of the literature of this research, we will find out the outcomes of this research is the same with the research of Hadizadeh and colleagues (2009) that is related to the emotional intelligence and the entrepreneurial personality in the Iran National Oil Company. Hadizadeh and colleagues also have expressed that there are positive and meaningful relation between emotional intelligence and entrepreneurial personality. Beside the results of this research is the same as research of Maghsoudi and colleagues (2005) that showed the features of the personality and psychology (emotional intelligence, creation, self-imagine, self-productivity and source of control) of the entrepreneurs in Tehran rather with ordinary people. With study the research of the "Zakarevicius" and "Zuperka" (2010) this will be clarified that the results of the present research are the same with the mentioned research, because this research is done in order to help the students of the university to develop and improve the done entrepreneurship and shows the relation between emotional intelligence with entrepreneurship. The results of this research is the same as research of "Zampetakis" and others (2009) showed that when the employees have more emotional intelligence the feeling of success will be more on them and this will be cause for developing of entrepreneurial personality on them. With consideration to the researches of "Tomczyk" and others (2009), "Zampetakis" and "others" (2008) and "Rhee" and "white" (2007) that each one of them have improve by a specific method the meaningful and positive relation between emotional intelligence and entrepreneurial personality, this will be clarified that the result of this research is the same with the results of their research.

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