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The Relation between Emotional Intelligence (EQ) and Mathematic Performance: a DEA-Based Approach

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Abstract

Emotional Intelligence (EQ) is considered as an alternative issue in both fields of psychology and education. Studies that have been conducted in this area illustrate the role of EQ and its components in different aspects of one's life such as academic achievement, occupation, and social relationships. Turning to a view to academic performance measurement, mathematics is considered as a science which can promote the learners' ability in order to respond to the ups and downs of every individual's life. Most of the previous papers have investigated the relationship between EQ and mathematical Performance. The main feature of those studies was focusing on statistical analysis. To deal with this issue, this study proposes an alternative procedure not only is interested in employing non parametric models, such as Data Envelopment Analysis (DEA), but also provides the statistical analysis to assess the questioned relation. The proposed procedure can serve as an evaluation tool for educational policy and students 'promotion. To do so, eighty-one individuals have been selected among Islamic Azad University (Yadegar -e- Imam Khomeini (RAH) branch) engineering students with simple random during the first midterm of academic year 2019-2020. Distributing a standard EQ questionnaire of Bradberry and Greaves [18] reveals EQ and its four components' scores. The average of three completed math scores have presented mathematical performance quantity. The results of DEA point out no specific pattern between EQ and mathematical performance. The study also reveals that statistical analysis show a similar trend as efficiency analysis method did.

Keywords: Data Envelopment Analysis (DEA), Mathematical performance, Efficiency analysis, Emotional Intelligence (EQ), Statistical analysis.

1 | Introduction

Intelligence is considered as one of the most important aspects of individuals' adaptation with the environment and one of the important factors of individual differences. Intelligence, according to its traditional definition, has long been considered as a major factor in academic achievement and success. Gardner [1] believed that it is not a single kind of intelligence that guarantees the success in life, but there is a wide range of intelligences that makes one succeed in different areas. The problem which also exists in our education system is that the system merely focuses on academic or educational ability of the students and overlooks their Emotional Intelligence (EQ). Austin et al. [2] claims that individual's social and emotional abilities and competences are considered as the effective and determining factors in students' academic achievement.

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The emotional skills are referred to those who know their emotions well and regulate them also understand and deal with others emotions effectively. The notation of EQ as a set of traits in determining one's destiny, can be determined by different areas. Some of most important areas are listed as "self-awareness", "self-management", "Social Awareness" and "relationship management". On the other hand, educational life is one of the most important aspects of one's life and has a profound impact on other dimensions of life. Meanwhile, one of the major problems in students' performance measurement in each country is their educational failure and the low level of students' academic performance. Various factors affect the individuals' academic performance and the education specialists have divided them into four categories of individual, school, family, and social factors. Karkiyanoush [3] confirms that one of the factors affecting one's academic performance is his/her intelligence and mental ability. Reyna and Brainerd [4] and Hakkarainen et al. [5] focused on Mathematics. They believed that math can affect all aspects of social life, such as decision making, learning, motivation, academic and occupational performance. Hembree [6] acknowledged that many people lose the educational and career opportunities they face, because of their fear of mathematics and their inability to do mathematics. There are some studies conducted the relationship between EQ and academic performance. Haddadi Koohsar et al. [7] and Lalifaz and Asgari [8] indicated that EQ has no effect on academic performance. Other studies including [9]-[12] claimed that EQ has a significant relationship with metacognitive skills or the academic performance of normal and non-virtual students. Rahnama and Abdolmaleki [13] have done a study on the relationship between EQ and creativity on Shahed University students. They concluded that EQ improved students' academic achievement. Saud [14] investigated the issue of EQ and academic performance. She found that EQ affects academic performance. Malik and Shahid [15] addressed the same issue in their study and showed that the level of EQ increases with the advances in academic achievement. Pourbahram and Hajizadeh [16] investigated the relationship between teachers' EQ and students' academic achievement in an EFL context, and found that the relationship between students' academic achievement and their teachers' EQ is actually very weak. Dev et al. [17] examined the relationship between university lecturers' EQ and the quality of their teaching performance and it was found that self-efficacy and EQ of the university instructors were highly and significantly related to their academic performance. With reference to above-mentioned studies and the importance of EQ controversial issues in today's world, it can be concluded that this phenomenon has significant impact on other norms of life and social interactions including the individuals' mathematical performance. All mentioned papers have implemented on statistical analysis. There is a huge difference between this study and previous ones. Firstly, non-parametric models such as Data Envelopment Analysis (DEA) have been applied for performance estimation. In this evaluation, four components of EQ and the mathematical performance is considered to reach the goal behind the study. The four components of EQ are arranged as "self-awareness", "self-management", "social Awareness" and "relationship management". What's more, the mathematic performance is remembered as the "average score" of three mathematic subjects. These scores are for students who had successfully completed courses of Pre-University Math, General Math (1) and General Math (2). All engineering students of Islamic Azad University, Yadegar -e- Imam Khomeini (RAH) branch were considered as statistical population and participated in study. Finally, 81 students were selected through simple random sampling method. Then the Standard EQ Questionnaire of Bradberry and Greaves [18] was distributed among these individuals. Equipped with this sample, all non-parametric models were performed. Then, statistical analysis and structural equations are employed to the data set. The aim of this paper is searching the relationship between the EQ and the mathematical performance of the selected sample. The results of all analysis claim no relation between EQ with four components (self-awareness, self-management, social awareness, and relationship management and the students' mathematical performance. The paper is organized as follows. Section 2 illustrates EQ and its components. Also, describes the notation of mathematical performance applied in the paper. The third section introduces a DEA- based approach for evaluating performance. A comparison between Statistical models and DEA-based approach is given in Section4. Conclusion will end the paper.

2 | Emotional Intelligence (EQ)

EQ is the ability to oversee the one's capacity to perceive, express, recognize, apply, and control emotions in himself and the others. Individuals with high social skills always seek to obtain: 1) a wide range of information about people, 2) quickly identify their common aspects, 3) accordingly establish an effective relationship. Jafari Roshan and Etemad [19] stated that these people are happy and productive in their lives and have kind of intellectual habits which make them useful and efficient. Tamannaifar et al. [20] remembered a definition of EQ and pointed out that EQ is a combination of emotional self-awareness, skills, and other abilities that influences one's success in dealing with environmental pressures and desires. EQ can be determined by different areas, the most important of them are listed here.

Self-Awareness: according to Goleman [21], self-awareness is the root of the components of EQ. Self – awareness assists to 1) achieve the goal of controlling our emotions and motivating ourselves, 2) employing a disposition with reference to ourselves along with the emotions of others and 3) developing social skills appropriate to our goal and practice. Samari and Tahmasbi [22] and Dehshiri [23] defined self-consciousness as a deep and clear understanding of one's feelings, emotions, weaknesses, strengths, needs, and desires.

Self-Management: self-control addresses the fact that we have a choice regarding the way of expressing our emotions. What is emphasized is the way of expressing emotions which should be in a way that facilitates the flow of thought, and also prevent its diversion [22] and [23].

Social Awareness: social intelligence or social awareness is defined as understanding the emotions and different aspects of others and applying three appropriate actions and favorite reactions for those around us [22] and [23].

Relationship Management: social skills or relationship management includes the ability to manage the relationships between ourselves and the others. Social skills do not only include making friends, although the people who have this skill are able to quickly create a friendly atmosphere with people [22] and [23]. Goleman [21] and Mayer et al. [24] both believed that those with higher emotional competence have greater ability to concentrate on problems and to use problem-solving skills. Thus, one's success in education and learning is related to the emotional-social skills, including EQ and its components. On the other hand, the advancement of various sciences leads to employing mathematics as an indispensable necessity in everyday life. In addition, the education system dare to pay more attention to the learners' mathematics performance. Because mathematics will educate those who are capable for dealing with different life issues through logical reasoning, and have power of analysis and abstraction. The notation of mathematical performance is referred to practices and exams that students have done in class and the results are reflected as a score. Owing to this fact, three scores of completed mathematics score are applied. The three courses are included as Pre-University Math, General Math (1), and General Math (2). Mathematical performance arose from the average score of these classes. Hence, mathematical performance is presented as a quantity.

3 | Theoretical Framework and Methodology

DEA is linked with comparative assessment of the efficiency of Decision Making Units (DMUs). Since the seminal work of Charnes and Cooper [25] DEA has demonstrated to be an effective technique for measuring the relative efficiency of a set of homogeneous DMUs which utilize the same inputs to produce the same outputs. Recently, DEA has been applied in evaluating the performance of different kinds of contexts such as hospitals, banks, education systems, cities, courts and business firms and many other applications [26]-[32]. In conventional DEA models, the efficiency of a DMU is obtained by maximizing the ratio of the weighted sum of its outputs to the weighted sum of its inputs, subject to the condition that this ratio does not exceed one for any unit. To describe the efficiency measurement, assume that there are n DMU ($DMU_j, j=1,...,n$), where each DMU produce s outputs, $y_{rj}; r=1,...,s$ by utilizing m inputs

$x_{ij}\ ; i=1,\ldots,m$. The maximum score is obtained subject to the conditions that this ratio $\theta_o = \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}}$ does not exceed one for any $DMU_j\ , j=1,\ldots,n$ and all the input and output weights are positive. Hence the linear following model of Charnes et al. [26] is used as:

$$
\begin{aligned}
\text{Max} \quad & \theta_o = \sum_{r=1}^{s} \bar{u}_r y_{ro}, \\
\text{s.t.} \quad & \\
& \sum_{i=1}^{m} \bar{v}_{io} x_{io} = 1, \\
& \sum_{r=1}^{s} \bar{u}_r y_{rj} - \sum_{i=1}^{m} \bar{v}_{io} x_{ij} \le 1, \quad j=1,\ldots,n, \\
& \bar{u}_r, \bar{v}_i \ge \varepsilon \quad \text{for all } r,i.
\end{aligned} \tag{1}
$$

Where $\bar{u}_r$ and $\bar{v}_i$ are non-negative weight variables and $\varepsilon > 0$ is a non-Archimedean small number. This model is a Constant Return to Scale (CRS) program and is called CCR envelopment model. Since, this model delivers assessments and targets with an output maximization orientation, the above linear programming is called output-oriented CCR model. The optimal objective function value of *model (2)* gives the efficiency measure for DMU_o. The efficiency ratio θ_o ranges between zero and one. DMU_o is being considered relatively efficient if it receives a score of one, otherwise, it is an inefficient unit. In conventional DEA applications, given a set of available measures, it is assumed that the status of each measure is clearly stated as an input or an output variable prior to using DEA. However, in higher education application, for instance, there is always a question that in assessing student's achievements, whether EQ is an input or an output? However, in the interest of gaining a higher efficiency score, the main question is "how to decide about the role of *EQ* for each student?". Without loss of generality assume that there are only three variable: x, y and z. Suppose also there exist K flexible measures ($z_{kj}(k=1,\ldots,K)$) with unknown input/output status to be chosen. Amirteimoori and Emrouznejad [33] introduced the following mix integer linear programming, where each DMU will set the status of variable z on the interest of their efficiency level. The model is as follows:

$$
\begin{aligned}
\text{Min} \quad & \theta, \\
\text{s.t.} \quad & \\
& \sum_{j=1}^{n} \lambda_j x_{ij} \le \theta x_{io} \quad, i=1,\ldots,m, \\
& \sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{ro} \ , \quad r=1,\ldots,s, \\
& \sum_{j=1}^{n} \lambda_j z_{kj} \le \theta z_{ko} + M\delta_{1k}, \quad k=1,\ldots,K, \\
& -\sum_{j=1}^{n} \lambda_j z_{kj} \le -z_{ko} + M\delta_{2k}, \quad k=1,\ldots,K, \\
& \delta_{1k} + \delta_{2k} = 1, \\
& \delta_{1k}, \delta_{2k} \in \{0,1\}, \\
& \lambda_j \ge 0 \quad, \ j=1,\ldots n \ .
\end{aligned} \tag{2}
$$

This is an input oriented model. Also let each DMU sets some of the flexible measures to input variables and some others to output variables to secure the best possible efficiency score. In this model, if $\delta_{1k} = 0$ then the flexible measure is selected as input and if $\delta_{1k} = 1$ the flexible measure is considered as output. Tohidi and Matroud [34] proposed a non-oriented model that selects an acceptable status for flexible measures. The proposed fractional programming problem considers multiple inputs and outputs situations and different types of return to scale has been recognized by this model. The model is as follows:

$$\begin{aligned}
&\text{Min} \quad \frac{\alpha}{\beta}, \\
&\text{s.t.} \\
&\sum_{j=1}^{n} \lambda_j x_{ij} \leq \alpha x_{io} \quad, i=1,\dots,m, \\
&\sum_{j=1}^{n} \lambda_j y_{rj} \geq \beta y_{ro} \;, \quad r=1,\dots,s, \\
&\sum_{j=1}^{n} \lambda_j z_{kj} \leq \alpha z_{ko} + M\delta_k , \quad k=1,\dots,K, \\
&-\sum_{j=1}^{n} \lambda_j z_{kj} \leq -\beta z_{ko} + M(1-\delta_k), \quad k=1,\dots,K, \\
&\sum_{j=1}^{n} \lambda_j = 1, \\
&\delta_k \in \{0,1\}, \\
&\lambda_j \geq 0 \quad , \; j=1,\dots n, \\
&\alpha, \beta \geq 0 .
\end{aligned} \tag{3}$$

Clearly, the model is mix integer fractional programming model and is always feasible. If $\delta_k = 0$ then the flexible measure is selected as input and if $\delta_k = 1$ the flexible measure is considered as output.

4 | Case Study Results and Discussions

4.1 | Efficiency Analysis

This section examines the relation between EQ and mathematic performance on a real case study. All engineering students of Islamic Azad University (Yadegar -e- Imam Khomeini (RAH) branch have participated in this study. Finally, 81 students were randomly chosen among the statistical population. As the primary goal, a standard questioner was distributed among these students. The questioner was derived from Bradberry and Greaves [18]. The data are collected and the EQ scores were calculated. In response to mathematical performance, the average of three mathematic scores are collected, too. Mathematical performance is referred to practices and exams students have done in class and the results are reflected as a final score. The three scores are concerned with General Math (1), (2) and Pre -University Math. *Table 1* reports the statistical description of data set.

Table 1. Statistical description of data set.

Input/ Outputs	Self-Awareness ($Input_1$)	Self-Management ($Input_2$)	Social Awareness ($Input_3$)	Relationship Management ($Input_4$)	EQ ($Output_1$)	Math Scores ($Output_2$)
Average	82.34	71.32	77.87	73.25	76.31	14.26
Std. Dev	8.51	14.58	10.24	13.24	9.20	2.26

According to performance analysis, each student can be considered as a DMU. As *Table 1* shows, columns 2-5 present the input factors and are included: self-awareness ($Input_1$), self-management ($Input_2$), social awareness ($Input_3$) and relationship management ($Input_4$). These four factors are derived from the questioner and are always fixed for calculating EQ. The first output ($Output_1$) is considered as EQ. As mentioned before, $Output_2$ consists of the average of three math scores. Regarding to data set, the efficiency analysis is grouped into three types. The first group is calculated with CCR model (*Model (1)*) with four inputs and $Output_2$. The obtained efficiency is called $Efficiency_1$. Then the CCR efficiency score ($Efficiency_2$) is investigated with EQ as the output and four defined inputs. The last efficiency score ($Efficiency_3$) is called as overall efficiency and obtained with two outputs and four inputs presented in

Table 1. The results are exhibited in *Table 2*.

Table 2. CCR efficiency scores.

DMU	$Efficiency_1$	$Efficiency_2$	$Efficiency_3$
1	0.57	0.74	0.74
2	1	1	1
3	0.81	0.79	0.83
4	0.58	0.75	0.75
5	0.64	0.81	0.81
6	0.95	0.85	0.96
7	0.62	0.78	0.78
8	1	1	1
9	0.67	0.81	0.81
10	0.80	0.76	0.82
11	0.70	0.77	0.77
12	0.71	0.80	0.80
13	1	1	1
14	0.56	0.76	0.76
15	0.71	0.75	0.75
16	0.94	0.85	0.95
17	0.58	0.73	0.73
18	0.76	0.78	0.80
19	0.61	0.89	0.89
20	0.57	0.73	0.73
21	0.63	0.78	0.78
22	1	0.94	1
23	0.56	0.72	0.72
24	0.78	0.95	0.95
25	0.58	0.75	0.87
26	0.82	0.79	0.82
27	0.70	0.75	0.75
28	0.41	0.78	0.78
29	0.60	0.78	0.78
30	0.85	0.78	0.87
31	0.40	0.77	0.77
32	0.49	0.76	0.76
33	0.61	0.75	0.75
34	0.62	0.81	0.81
35	0.69	0.76	0.76
36	0.51	0.78	0.78
37	0.59	0.82	0.82
38	0.59	0.79	0.79
39	0.75	0.87	0.87
40	0.66	0.75	0.75
41	0.99	0.97	0.99
42	0.77	0.78	0.81
43	0.70	0.76	0.76
44	0.83	0.74	0.84
45	0.59	0.76	0.76
46	0.61	0.77	0.77
47	0.63	0.83	0.83
48	0.66	0.77	0.77

Table 2. (Continued).

DMU	$Efficiency_1$	$Efficiency_2$	$Efficiency_3$
49	0.62	0.77	0.77
50	0.53	0.76	0.76
51	0.73	0.73	0.76
52	0.63	0.73	0.73
53	0.80	0.83	0.84
54	0.61	0.72	0.72
55	0.5	0.79	0.79
56	1	0.81	1
57	0.78	0.76	0.8
58	0.75	0.8	0.8
59	0.67	0.87	0.87
60	0.75	0.75	0.78
61	0.96	1	1
62	0.85	0.81	0.88
23	0.57	0.8	0.8
64	0.7	0.75	0.75
65	0.77	0.77	0.79
66	0.58	0.73	0.73
67	0.7	0.76	0.76
68	0.92	0.95	0.95
69	0.7	0.61	0.7
70	0.7	0.84	0.84
71	0.58	0.77	0.77
72	0.64	0.77	0.77
73	0.55	0.76	0.76
74	0.76	0.82	0.82
75	0.89	0.8	0.89
76	0.63	0.78	0.78
77	1	0.74	1
78	0.51	0.82	0.82
79	0.87	0.59	0.87
80	0.7	0.78	0.78
81	0.82	0.75	0.84

As *Table 2* reports units #2, 8 and 13 are efficient in all categories. Units #22, 56 and 77 are efficient in first and third group. While unit#61 is efficient in second and third group. It can be inferred that units#22 and 61 are significantly near the efficient frontier. The scores 0.94 and 0.96 are the major contributor to the inefficiency in these units. When it comes to mathematic scores, the efficient units #2, 8 and 13 display the average 19.6, 14.6 and 14.8 respectively. But, their EQ numbers are 85, 56 and 66. The gap between these numbers are large. The first one, 85, seems quite high, while, the others are lower than the first number. A more detailed analysis on other efficient units, #22, 56, 61 and 77 serve other information about the students. Their math average numbers are 16.8, 18, 14.8 and 18.6. The observation of their EQ quantities draws these numbers separately: 74, 62, 89 and 65. Despite having the upper EQ score, 89, unit#61 has the lower math average, 14.8. On the other hand, unit#56 shows the math score 18, which named high. Meanwhile, the EQ score lies in low group (62). As the efficiency results show we failed to find the specific plan between EQ scores and math performance. Equipped with *Table 2*, most units significantly have high efficiency scores in columns 2 and 3. These numbers suffer from the dependency between the input and output measures. Since, EQ scores are derived from these four specific inputs, so the efficiency measure tends to increase.

Whilst, in the first column of *Table 2* this trend is lost. Because the independency between inputs and the only output is adopted. To resolve this deficiency, flexible measure models are supposed. As before, the four factors are reported as inputs. $Output_2$, math score, are presented as output measure. The flexible measure here is EQ Scores. The status of EQ scores for each student will be determined by the *Models (2)* and *(3)*. The results of *Models (2)* and *(3)* are reported under heading "efficiency with flexible variable" in *Table 3*. The optimal values of δ_{1k}, δ_{2k} in *Model (2)* and δ_k in *Model (3)* indicate that either EQ was considered as an input or as an output variable in the assessment model.

Table 3. Efficiency with flexible variable.

DMU	Model (2)	δ_{1k}	δ_{2k}	Model (3)	δ_k
1	0.58	0	1	0.57	0
2	1	1	0	1	0
3	0.83	1	0	0.81	0
4	0.58	0	1	0.58	0
5	0.65	0	1	0.64	0
6	0.95	1	0	0.95	0
7	0.63	0	1	0.62	0
8	1	1	0	1	0
9	0.68	0	1	0.67	0
10	0.82	1	0	0.8	0
11	0.77	1	0	0.7	0
12	0.72	0	1	0.71	0
13	1	1	0	1	0
14	0.56	0	1	0.56	0
15	0.75	1	0	0.71	0
16	0.94	0	1	0.94	0
17	0.59	0	1	0.58	0
18	0.76	0	1	0.76	0
19	0.61	0	1	0.61	0
20	0.58	0	1	0.58	0
21	0.64	0	1	0.63	0
22	1	1	0	1	0
23	0.56	0	1	0.56	0
24	0.75	0	1	0.78	0
25	0.82	0	1	0.85	0
26	0.82	1		0.82	1
27	0.75	1	0	0.7	0
28	0.41	0	1	0.41	0
29	0.6	0	1	0.6	0
30	0.85	0	1	0.85	0
31	0.5	0	1	0.49	0
32	0.49	0	1	0.49	0
33	0.61	0	1	0.61	0
34	0.62	0	1	0.62	0
35	0.76	1	0	0.69	0
36	0.52	0	1	0.51	0
37	0.59	0	1	0.59	0
38	0.59	0	1	0.61	0
39	0.77	0	1	0.75	0
40	0.66	0	1	0.66	0
41	0.99	0	1	0.99	0
42	0.77	0	1	0.77	0
43	0.7	0	1	0.7	0
44	0.84	1	0	0.83	0
45	0.6	0	1	0.59	0
46	0.62	0	1	0.61	0

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Table 3. (Continued).

DMU	Model (2)	δ_{1k}	δ_{2k}	Model (3)	δ_k
47	0.63	0	1	0.63	0
48	0.66	0	1	0.66	0
49	0.63	0	1	0.62	0
50	0.53	0	1	0.53	0
51	0.73	0	1	0.73	0
52	0.66	0	1	0.63	0
53	0.84	1	0	0.81	0
54	0.61	0	1	0.61	0
55	0.5	0	1	0.5	0
56	1	1	0	1	0
57	0.8	1	0	0.78	0
58	0.8	1	0	0.75	0
59	0.69	0	1	0.67	0
60	0.75	0	1	0.75	0
61	0.96	0	1	0.96	0
62	0.85	0	1	0.85	0
23	0.58	0	1	0.57	0
64	0.75	1	0	0.7	0
65	0.79	1	0	0.78	0
66	0.59	0	1	0.58	0
67	0.76	1	0	0.7	0
68	0.92	0	1	0.92	0
69	0.7	1	0	0.7	1
70	0.7	0	1	0.7	0
71	0.58	0	1	0.58	0
72	0.64	0	1	0.64	0
73	0.56	0	1	0.55	0
74	0.82	1	0	0.76	0
75	0.89	1	0	0.89	0
76	0.63	0	1	0.63	0
77	1	1	0	1	0
78	0.52	0	1	0.51	0
79	0.87	1	0	0.87	1
80	0.7	0	1	0.71	0
81	0.82	0	1	0.82	0

Both flexible models identified six efficient units. The results clearly show that there is not any gap between efficiency scores. Obviously, the optimal values of δ_{1k} and δ_{2k} in *Model (2)* admit that 56 units (out of 81) have treated EQ as an input measure and 25 units have treated this flexible measure as an output measure. Also, the optimal values of δ_k in *Model (3)* record that 78 units treat EQ as an input measure and only 3 units (units #26, 69 and 79) have treated this measure as an output. In *Model (2)* the efficient units treat this flexible measure as an output. In contrast, in *Model (3)*, they select the flexible measure as an input. In fact, it might be due to nature of the proposed model. Therefore, by considering the majority of input status in these two cases, it is proposed to choose this flexible measure as an input measure. According to efficient units in these models, the EQ and mathematic scores follow no specific pattern. As an example, take unit 22, where EQ score is considered high, 74. It is expected that the math score comes over 17. But it is lower that this number. Unit 77 has a high math score, 18.6. When it comes to EQ score, it is surprisingly not high. The range is 65.

Again we fail to find a pattern between EQ scores and math performance. Take units #41 and 61 as another example, the CCR efficiency score is 0.99 and 0.96 respectively. The quantities (0.01) and (0.04) are the main contributor in unit inefficiency. Moreover, unit#41 has the low EQ score (58) and math score (13.5). In addition, this unit becomes efficient by adjusting EQ measure as an input. Unit#61 has the lower math score (14.8) while the EQ score shows a high value (89). This unit treats EQ as an input measure, too. This fluctuation confirms that there is no plan to follow between EQ score and math performance. As discussed the flexible measure models made the flexible measure (EQ) to treat as input. Toward this end, *Model (1)* was applied on *Table 1* data set. Five factors are selected as inputs: self-awareness ($Input_1$), self-management ($Input_2$), social awareness ($Input_3$), relationship management ($Input_4$) and EQ as the fifth input. The only output is math score. The efficient units are reported in *Table 4*.

Table 4. Efficient units with EQ as input measure.

DMU	Efficiency Score	EQ	Math Score
2	1	85	19.6
8	1	56	14.6
13	1	66	14.8
22	1	74	16.8
56	1	62	18
77	1	65	18.6
79	1	62	18

As the *Table 4* records the results are consistent with flexible measure models. Specifically, the efficient units are same. Hence, the focus on treating EQ as input can determine that there is no specific plan between math performance and EQ scores. In addition, one might be interested in statistical test for more details. In the following subsection statistical analysis is reported.

4.2 | Statistical Analysis

As efficiency analysis admits there is no specific pattern between EQ and math performance. In order to draw a better picture of relation from statistical aspect, the variables are summarized in two groups: independent and dependent variables. Here, the first group of variables are: self-awareness, self-management, social awareness, relationship management and EQ. Also, dependent variable is math performance. Before analyzing the relation between variables, a multiple correlation coefficient or R index is calculated. *Table 5* presents Predictive Coefficients of dependent variable behavior.

Table 5. Predictive coefficients of dependent variable behavior.

Dependent Variable	Multiple Correlation Coefficient (R)	Coefficient Determination (R^2)
Math Performance	0.208	0.043

As *Table 5* shows, the R index value is extremely low, i.e.0.208. According to Kessel values for R index values, this relation is located in first quadrate or in "low and weak" category. The value of second coefficient, R^2 illustrates that four factors of EQ together can predict only 0.043% of behavior of dependent variable. As a result, we can claim that the dependent variable prediction has been performed inadequately and weakly. As another feature of statistical analysis, test of hypothesis has been operated. The initial hypothesis H_o admits there is no relation between the factors. The results are listed in *Table 6*.

Table 6. Test of hypothesis.

Hypothesis	β	P Value/Sig	t Value	Results
Self-awareness has effect on math performance	-0.197	0.199	-0.197	Reject
Self-management has effect on math performance	0.151	0.286	0.151	Reject
Social awareness has effect on math performance	-0.115	0.400	-0.846	Reject
Relationship management has effect on math performance	0.143	0.398	0.849	Reject
EQ has effect on math performance	0.071	0.700	0.387	Reject

As *Table 6* informs all hypothesis are rejected. The quantity of P *value/sig* in whole estimations are higher than 0.05. Top of all, t *value* is located in an interval (-1.96, 1.96). Therefore, with confidence level 99% we can claim that hypothesis H_o is accepted. The obtained results are in consistent with efficiency analysis. Hence, there is no specific pattern between EQ and math performance. With the aim of testing significance of above hypothesis, structural equation is applied. To address this issue, if the value of significance coefficient t becomes higher than 1.96, with confidence level 95% the hypothesis can be certified. *Fig. 1* draws significance coefficient t for this data set.

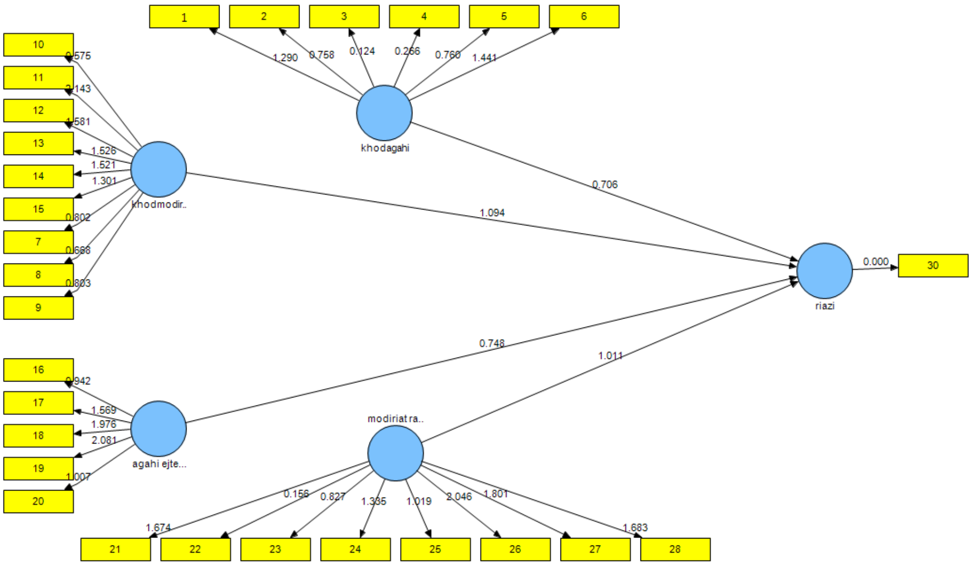

Fig. 1. Significance coefficient t.

Employing β test, the orientation and strength of studied relation between mentioned factors can be highlighted. *Fig. 1* presents the standard coefficient assigned for each path. With reference to *Fig. 1*, probing each path and hearing the significance of each path come to argue. This assertion shows that which hypothesis is acceptable. The results are recorded in *Table 7*.

Table 7. The results of structural equations.

Hypothesis	Significance Coefficient	β Coefficient	Results
Self-awareness has effect on math performance.	0.706	-0.146	Reject
Self-management has effect on math performance.	1.094	0.225	Reject
Social awareness has effect on math performance	-0.115	0.400	Reject
Relationship management has effect on math performance	0.748	-0.093	Reject
EQ has effect on math performance	1.011	0.225	Reject

By means of *Table 7*, the structural equations results certify the previous conclusions. The obtained results are in consistent with efficiency analysis and Statistical Analysis. To sum up, there is no specific pattern between EQ and math performance.

5 | Conclusion

In recent years, EQ can observe as one of the indicators that make succeed in different areas. Although, it is highly linked with its four important components. The components are arranged as "social awareness", "self –awareness", "self –management" and "relationship management". In addition, educational system dare to pay more attention to the learners' mathematics performance. Because, they found that mathematics can educate those who are capable for dealing with different life issues through logical reasoning and enhance the power of analysis and abstraction. In most of earlier studies the relationship between mathematical performance and EQ has been investigated by statistical analysis. The focus of this study was implementing a non-parametric model, such as DEA to determine the efficiency analysis. As a second step, the statistical analysis has been employed too. Applying simple random sampling method, 81 individuals were selected among Islamic Azad University (Yadegar -e-Imam Khomeini (RAH) branch) engineering students during the first midterm of academic year 2019-2020. A standard EQ questionnaire interpretation revealed five types of scores: EQ and its four components. The quantity of mathematic performance arose from the average of three completed math classes. The main finding of non-parametric model was that there exists no pattern between EQ and mathematical performance. From the statistical analysis attitude, the similar results were stated. Interestingly, all results were strongly claimed that there exists no relation between EQ and math performance.

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