MATHEMATICAL MAT SCORE PREDICTION & POST-MAT ACADEMIC PERFORMANCE ANALYSIS ON MANAGEMENT STUDENTS

[1]Sk. Samim Ferdows, [2]Joydeep Dey, [3]Akash Nag, [4]Sk. Sahin Ferdows, [5]Sunil Karforma

[1]*Department of Mathematics*
M.U.C. Women's College, Burdwan, West Bengal, India
Email: samimstat@gmail.com

[2,3]*Department of Computer Science*
M.U.C. Women's College, Burdwan, West Bengal, India
Email: joydeepmcabu@gmail.com, [3]nag.akash.cs@gmail.com

[4]*Student of Hemsheela Model School*
Durgapur, Paschim Bardhaman, West Bengal, India
Email: samimstat@gmail.com

[5]*Professor & Head, Department of Computer Science*
The University of Burdwan, Burdwan, West Bengal, India
Email: sunilkarforma@yahoo.com

Abstract

In India, the Management Aptitude Test (MAT) score is taken as the primary indicator of a student's ability to be enrolled in the management courses. It has been observed in many cases during the group discussion and personal interview phases for MBA course admission, that candidate with poor MAT scores do well than those with higher scores. Hence, in that context, this research was carried out in order to assess the validity of MAT scores in predicting future success and also to measure the nature and strength of association between MAT scores and academic achievements. We also look at the correlation between students' academic performance in their higher-secondary & under-graduate levels, and their MAT scores.

Keywords: *Management Aptitude Test (MAT) score, academic achievement, management courses*

INTRODUCTION

The MAT score, in most management institutes of India, based on an all India management aptitude test conducted by All India Management Association (AIMA), has been considered as the primary indicator of a student's ability to be enrolled in the management courses. The primary asset of MAT score is that it provides a common measure, administered under standard condition with known reliability and validity for evaluating the academic skills of many individuals.

MAT score has two important characteristics:

1. It is a reliable measure of certain development skills that is found to be important in the business management study.

2. Unlike graduate level marks, MAT score is based on the same standards for all candidates.

   These two characteristics naturally make MAT score a favourite choice for a majority of B-schools who otherwise find it difficult to assess the aptitude of the prospective candidates who wish to make a career in the field of business management. Though AIMA proclaims that it conducts periodic studies to check the ability of MAT score in predicting academic success in the first year of study of the postgraduate courses, independent researches in this area could throw valuable insights. It would be worthwhile to periodically and empirically assess whether it is serving several times as it was losing its predictive validity.

In many instances during the group discussion and personal interview of prospective students for MBA course, the author found that people with poor MAT scores did very well, whereas the candidates with very high MAT score did abysmally. Other faculty colleagues in the author's institution as well as in other B-schools shared similar concerns. Hence, the idea for this research germinated. It can also be assessed whether MAT score alone, or both MAT score and GPA taken together are related to each other for the academic achievement of the students.

PRIOR WORK

The importance of intelligence as a contributing factor towards achievement is researched time and again. Among the studies the studies under consideration, those who have considered intelligence as a variable contributing towards achievement are-Agrawal (1973), das (1975), Rajput(1984), Singh (1984), das (1986), Deshpande (1986), Kmar (1986), Mehrotra (1986), and Patel (1986). All the studies have shown that intelligence, in general, is a factor contributing towards achievement. Dixit (1985) made a comparative study of the academic achievement and intelligence of adolescent boys and girls. Some studies gave considered specific aspects of intelligence; Chhikara (1985) arrives at a positive relationship between reasoning abilities and achievement of concepts.

In the US, the research in SAT score accuracy has generally indicated that students reports' correlate with actual scores in the range of 0.60 to 0.80 (Goldman et al ., 1990 ; Trice , 1990 ; Flake and Goldman , 1991 ; Frucot and Cook , 1994 ; Geiser and Studley ,2001 ; Stumpf and Stanley ,2002 ; and Rothstein , 2004).

Based on an empirical research, Frey and Detterman (2004) have reported that SAT is an adequate measure of general intelligence. Further, they even tired to show that SAT scores could be converted into estimates of IQ using regression equations. However, in a study to assess how well high school Grade Point Average (GPA) and high school SAT scores predict college-level success and performance, Abdel-salam et al. (2005) found that there is a very weak relationship between

SAT scores and college performance. However, the authors reported high school GPA as a more reliable predictor of college-level success and performance.

The study by Tiwri (1986) suggested a similar conclusion. In the study of singh (1983), the mental abilities-numerical ability, reasoning ability, memory and symbolic representation-indicates a positive influence on achievement. A factorial and validation study of the abilities involved on learning chemistry at the ninth grade stage was carried out by Rajrani (1986). It was revealed that only seven of Guilford's structure of intellect abilities predicted achievement.

AIMS AND METHODS

OBJECTIVES

The objectives of this study were four-fold:

a) To quantify the academic performance in higher-secondary and undergraduate level, that is the key indicators for high MAT scores.

b) To test the significant predictive ability of MAT score on predicting academic achievement in MBA course.

c) To assess whether there is any significant correlation between MAT score and IQ (GPA Score).

d) To assess whether MAT score alone or MAT score and IQ (GPA Score) taken together is a better predictor of academic achievement in the MBA course.

METHODOLOGY

MAT score was obtained from records kept by the academic section of the author's Institute. GPA was obtained from the examination department of the institute as a measure of academic achievement.

Since the study was primarily a correlation study, the analysis involved calculation of Pearson's product Moment Correlation, Coefficient of Determination and partial and Multiple Correlation using a sample of 175 PGDM students. Here we have done regression analysis for predicting of MAT score on predicting academic achievement in MBA course.

Furthermore, using the records of prior academic performance of students, we have applied the C4.5 decision tree algorithm (Quinlan 2014) to map the correlation between that academic performance will their present MAT scores. A training-set size of 110 was selected for this purpose. The dataset had the parameters: higher-secondary percentage, graduation percentage, sex, stream of graduation, and their MAT score.

RESULTS AND DISCUSSION

Table 1. Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Error	Std. Deviation Statistic
AVCGPA	110	2.47	7.19	8.57	6.92	4.21	0.73
MATSCORE	110	442	410	846	544..57	10.66	95.74
Valid N (listwise)	110						

Table 2. Descriptive Statistics

Skewness Statistic	Std. Error	Kurtosis Statistic	Std. Error
0.61	0.41	-0.27	0.51
1.78	0.43	1.34	0.61

Pearson product moment correlation values between MAT score and GPA is found to be 0.645 that is statistically significant at 0.01 level of significance. This implies that all the three variables, namely, MAT score and GPA are positively interrelated with each other. Drawing quick conclusions from correlation studies, however, could be quite risky. For, we should not forget the fact that though the strength of the relationship between any two variables is indicated by the coefficient of correlation r, it is actually measured by the coefficient of determination r^2.

The relationship between any two or more variables, as measured by the coefficient of correlation can be strong yet not significant, and measured by the relationship can be weak but significant. Therefore, the coefficient of determination r^2 is a better and more stable measure for measuring the predictive validity of any variable. It tells us as to what percentage of variance in the criterion variable can be explained by the predictor variable. Statistically, it is the squared value of correlation coefficient (r).

In the present study, the coefficient of determination values between MAT score and GPA war found to be 0.645. This implies that MAT score can successfully explain the variance in IQ for only about 9% of the cases.

Coefficient of Determination (r^2) =0.645

As far as predicting academic achievement is concerned, MAT could explain the variance in GPA in only about 21% of the cases.

Table 3. Correlation Matrix

	MAT Score	GPA
MAT Score	1	0.645
GPA	0.645	1

Note: ** significant at 0.01 level of significance.

Here we have tried to fit a regression model.

The model is Y= a+ bX

where Y= Mat score   and X= GPA score a and b are constant.

Table 4. Regression Statistics

Multiple R	0.640221996
R Square	0.409884204
Adjusted R Square	0.40120603
Standard Error	.412
Observations	110

Table 5.ANOVA

	df	SS	MS	F	Significance F
Regression	1	252467.824	252467.824	47.23162	2.40491E-09
Residual	108	363481.319	5345.31352		
Total	109	615949.143			

Table 6. Regression statistics

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-100.4912669	90.1904238	-1.1142122	0.269111	-280.4634533	79.48091959	-280.463453	79.48092
X Variable 1	91.9442784	13.3785265	6.87252656	2.4E-09	65.24784484	118.640712	65.2478448	118.64071

We should include more factors such as an essay or some psychological assessment components so as to enhance its predictive validity. However, it does not mean that MAT score in its present form is not a validity. However, it does not mean that MAT score in its present form is not a valid instrument.

It is indeed a good screening device as far as assessing the overall aptitude of the candidates is concerned and it does provide valuable inputs that help a management institution in assessing the suitability of a candidate for admission. With a little modification, however, its utility could be increased manifold. Under these circumstances it is advisable to take the MAT scores with a pinch of salt. That is the selection decision for suitability of candidates should invariably be supplemented by rigorous group discussion, extempore, experiential exercise, psychological assessment and/or personal interview.

The MAT scores were categorized into Low, Average, and High; where the High category reflected a percentile above 80, while Low refers to a score below 50. From the decision tree results, an accuracy of 68% was achieved and the following conclusions could be drawn based on the dataset:

a) Female students in the Science stream generally scored low.

b) Most Arts stream students generally scored high.

c) In the Engineering stream, the HS marks were significant. Students scoring above 70% in their HS examinations scored higher in MAT irrespective of their sex or graduation percentage. However, if HS is less than 70%, graduation must be in 1st class (i.e. 60% or above). Females scored high when their graduation percentage was greater than 72% and their HS percentage was above 63%.

d) In Commerce stream, if graduation was above 87%, the student obviously scored high in MAT even if their HS was below 60%. If HS was above 75%, a 1st class graduate male always scored high in MAT.

e) In all other streams, females scored higher than their male counterpart, provided their HS was above 75%.

LIMITATIONS

1. The present study was conducted on a very small sample (n = 110) and that too on the students of a single batch in a specific B-school. Therefore, the results cannot be generalized without conducting further research with a bigger sample and with a cross section of different B-schools.

2. However, it is only a correlation study and, effect relationship can be established with this study. In statistical analysis also, only different measures of correlation and coefficient of determination have been used for the purpose of analysis and interpretation.

3. And research could be carried out in this area with a bigger and more widespread sample size and more rigorous statistical tools and techniques of analysis.

CONCLUSION

Further, it is only a correlation study and effect relationship can be established with this study. In statistical analysis also only different measures of correlation and coefficient of determination have been used for the purpose of analysis and interpretation. Further researches could be carried out in this area with a bigger and more widespread sample size and more rigorous statistical tools and techniques of analysis. It is also observed that all the two variables, namely, MAT score and CGPA are positively interrelated with each other. Coefficient of Determination (R Square) =0.645. The value of F statistics is quite high. This implies MAT SCORE and CGPA are significant.

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Appendix A: Dataset

STUDENT'S NAME	1st SEM	2nd SEM	3rd SEM	4th SEM	5th SEM	Average CGPA	MAT Score
S1	7.33	7.33	8.00	8.17	8.67	7.90	592
S2	6.87	7.10	8.00	8.17	7.33	7.49	615
S3	6.87	7.10	7.50	8.00	7.50	7.39	650
S4	6.10	6.33	7.00	7.33	7.50	6.85	512
S5	5.00	5.67	6.67	7.33	6.83	6.30	514
S6	6.33	6.50	7.17	7.50	6.80	6.86	525
S7	5.00	5.67	6.10	6.33	6.33	5.89	467
S8	5.67	5.00	5.67	6.00	6.00	5.67	441
S9	6.00	6.20	8.50	7.83	7.20	7.15	536
S10	6.20	6.00	7.16	7.00	6.50	6.57	673
S11	6.20	6.83	8.00	7.80	7.33	7.23	610
S12	6.70	6.70	7.20	7.33	7.50	7.09	685
S13	5.70	5.80	5.90	6.70	6.70	6.16	460
S14	6.33	6.50	7.50	7.80	7.33	7.09	470
S15	6.17	7.00	7.67	8.17	8.17	7.44	770
S16	5.83	6.12	6.00	6.00	6.50	6.09	489

S17	7.00	7.67	8.17	8.33	7.83	7.80	563
S18	6.80	7.10	7.60	7.67	7.50	7.33	820
S19	5.20	5.40	6.00	6.00	6.30	5.78	419
S20	6.20	6.50	6.50	6.30	6.80	6.46	540
S21	5.40	5.80	6.10	6.40	6.30	6.00	432
S22	7.00	7.67	8.17	8.17	8.00	7.80	647
S23	4.80	5.90	5.80	5.60	5.83	5.59	447
S24	6.00	6.10	6.80	6.60	6.67	6.43	498
S25	6.10	6.30	7.10	7.33	7.33	6.83	663
S26	8.00	8.67	8.17	8.33	8.00	8.23	593
S27	6.00	6.17	6.67	6.67	6.33	6.37	428
S28	5.60	6.17	6.33	6.10	6.33	6.11	428
S29	6.10	6.33	6.67	7.10	7.33	6.71	498
S30	6.10	6.10	6.00	6.00	6.67	6.17	428
S31	8.33	8.33	8.67	8.33	8.33	8.40	610
S32	5.50	5.60	5.80	6.00	6.00	5.78	393
S33	5.80	6.20	7.00	7.50	7.50	6.80	400
S34	6.80	7.30	7.67	7.67	7.67	7.42	560
S35	5.80	5.20	6.30	6.67	6.67	6.13	455
S36	6.00	6.17	6.30	6.30	6.80	6.31	498
S37	5.56	6.50	7.50	7.50	7.33	6.88	529
S38	6.17	6.33	6.33	7.00	7.00	6.57	540
S39	6.00	6.17	6.80	7.50	7.33	6.76	500
S40	5.00	5.67	6.83	6.67	7.50	6.33	514
S41	5.30	5.60	6.30	6.30	6.80	6.06	462
S42	5.60	5.80	6.20	6.80	7.20	6.32	441

S43	6.00	6.30	6.30	7.00	7.10	6.54	524
S44	7.00	7.30	7.67	7.67	7.50	7.43	564
S45	7.00	7.30	7.50	7.83	7.50	7.43	568
S46	5.50	5.80	6.10	6.30	6.80	6.10	487
S47	6.30	6.80	8.50	8.17	7.50	7.45	400
S48	5.50	5.80	6.30	7.00	7.30	6.38	395
S49	5.60	5.80	6.30	6.80	6.80	6.26	422
S50	6.10	6.67	6.80	6.80	7.00	6.67	498
S51	6.10	6.10	6.60	6.60	7.00	6.48	468
S52	5.30	5.50	6.00	6.17	6.80	5.95	438
S53	6.30	6.67	7.50	7.50	7.33	7.06	790
S54	6.00	6.17	6.67	6.67	6.33	6.37	428
S55	5.00	5.67	6.67	7.33	6.83	6.30	514
S56	6.00	6.20	8.50	7.83	7.20	7.15	536
S57	6.08	6.00	7.00	7.08	7.77	6.79	512
S58	5.33	6.67	6.50	7.00	7.17	6.53	510
S59	6.33	6.67	7.33	7.50	8.00	7.17	554
S60	6.00	6.17	6.67	6.67	6.33	6.37	428
S61	5.60	6.17	6.33	6.10	6.33	6.11	428
S62	6.10	6.33	6.67	7.10	7.33	6.71	498
S63	6.10	6.10	6.00	6.00	6.67	6.17	428
S64	8.33	8.33	8.67	8.33	8.33	8.40	610
S65	5.50	5.60	5.80	6.00	6.00	5.78	393
S66	5.80	6.20	7.00	7.50	7.50	6.80	400
S67	6.80	7.30	7.67	7.67	7.67	7.42	560
S68	5.80	5.20	6.30	6.67	6.67	6.13	455

S69	6.00	6.17	6.30	6.30	6.80	6.31	498
S70	5.56	6.50	7.50	7.50	7.33	6.88	529
S71	6.20	6.00	7.16	7.00	6.50	6.57	673
S72	6.20	6.83	8.00	7.80	7.33	7.23	610
S73	6.70	6.70	7.20	7.33	7.50	7.09	685
S74	5.70	5.80	5.90	6.70	6.70	6.16	460
S75	6.33	6.50	7.50	7.80	7.33	7.09	470
S76	6.17	7.00	7.67	8.17	8.17	7.44	770
S77	5.83	6.12	6.00	6.00	6.50	6.09	489
S78	7.00	7.67	8.17	8.33	7.83	7.80	563
S79	6.80	7.10	7.60	7.67	7.50	7.33	820
S80	5.20	5.40	6.00	6.00	6.30	5.78	419
S81	6.20	6.50	6.50	6.30	6.80	6.46	540
S82	5.40	5.80	6.10	6.40	6.30	6.00	432
S83	7.00	7.67	8.17	8.17	8.00	7.80	647
S84	4.80	5.90	5.80	5.60	5.83	5.59	447
S85	6.00	6.10	6.80	6.60	6.67	6.43	498
S86	6.10	6.30	7.10	7.33	7.33	6.83	663
S87	8.00	8.67	8.17	8.33	8.00	8.23	593
S88	6.00	6.17	6.67	6.67	6.33	6.37	428
S89	5.60	6.17	6.33	6.10	6.33	6.11	428
S90	6.10	6.33	6.67	7.10	7.33	6.71	498
S91	6.10	6.10	6.00	6.00	6.67	6.17	428
S92	8.33	8.33	8.67	8.33	8.33	8.40	610
S93	5.50	5.60	5.80	6.00	6.00	5.78	393
S94	5.80	6.20	7.00	7.50	7.50	6.80	400

S95	6.80	7.30	7.67	7.67	7.67	7.42	560
S96	5.80	5.20	6.30	6.67	6.67	6.13	455
S97	6.00	6.17	6.30	6.30	6.80	6.31	498
S98	5.56	6.50	7.50	7.50	7.33	6.88	529
S99	6.17	6.33	6.33	7.00	7.00	6.57	540
S100	6.00	6.17	6.80	7.50	7.33	6.76	500
S101	5.00	5.67	6.83	6.67	7.50	6.33	514
S102	5.30	5.60	6.30	6.30	6.80	6.06	462
S103	5.60	5.80	6.20	6.80	7.20	6.32	441
S104	6.00	6.30	6.30	7.00	7.10	6.54	524
S105	7.00	7.30	7.67	7.67	7.50	7.43	564
S106	7.00	7.30	7.50	7.83	7.50	7.43	568
S107	5.50	5.80	6.10	6.30	6.80	6.10	487
S108	6.30	6.80	8.50	8.17	7.50	7.45	400
S109	5.50	5.80	6.30	7.00	7.30	6.38	395
S110	5.60	5.80	6.30	6.80	6.80	6.26	422