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EMOTIONAL INTELLIGENCE SCALE: A CONFIRMATORY FACTOR ANALYSIS APPROACH

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ABSTRACT

The aim of present study is to examine the factor structure, construct validity and reliability of Emotional Intelligence Scale developed by Bhattacharya that consists of 40 items. The study concerned 100 managers and 300 non managers from 10 companies who are working in Indian Automobile Sector. The respondents were asked to respond a five point Likert scale that from never true to always true. The collected data was analyzed with help of SPSS 18.0 and Moment of Structure version 18 (AMOS) software packages. An exploratory factor analysis was conducted to find out the number of latent variables that was needed to explain the correlations among a set of observed variables after that a first order confirmatory factor analysis (CFA) applied. Emotional Intelligence Scale constructs revealed a satisfactory level of internal consistency A good model fit was found for the measurement model (First order CFA model) using several fit indices like chi square/degree of freedom (CMIN/DF), comparative-fit index (CFI), Tucker Lewis index (TLI) and root mean square error of approximation (RMSEA) showed that all fit indices criteria were fulfilled or model is good fit. The indices of convergent validity, discriminant validity and reliability like CR, AVE, MSV, ASV and Cronbach's Alpha also showed the good acceptable value of all the construct of measurement model of Emotional Intelligence Scale.

INTRODUCTION

The concept of emotional intelligence is relatively new area of interest within organizations. As organizations are facing with greater challenges as a result of globalization, high competition for talent, and shortage of budgets, it is very important that management should have a keen understanding of what makes their employees highly effective in their work (Emmerling and Goleman, 2003). In order to understand individuals at their emotional core, it is helpful to take inventory of the levels of emotional intelligence of their employees and managers. Emotional Quotient is defined as a set of competencies demonstrating the ability one has to recognize his or her behaviors, moods, and impulses, and to manage them best according to the situation (Gupta, 2014). Emotional Intelligence scale also called Bhattacharya Instrument on Emotional Intelligence (BEIS In.) developed by Bhattacharya in 2003. This Instrument was used in study to find out the level of emotional intelligence.

BACKDROP

Karim (2009) in his study used covariance based structural equation modelling indicated that only negative affect fully mediated the relationship between emotional intelligence and psychological distress. Negative affect had a significant direct influence on psychological distress, but the relationship between positive affect and psychological distress was not significant. **Cakan and Akbaba (2005)** conducted a study on adaptation of emotional intelligence scale for Turkish educators. Exploratory and Confirmatory factor analyses were performed to confirm the authors' model and findings of the previous study. The validity and internal consistency showed with the help of one, two, three and four factor model. The result revealed that there is no significant difference between male and female emotional intelligence score. Study also discovered that emotional intelligence scores of the respondent were not increased in proportion to their age and job experience. **Schutte et al. (2011)** have predicted and found that gender differences in their measure of trait in emotional intelligence with female scoring more than males. **Madona and Gainor (2001)** stated that females do display higher degree of emotional intelligence than their male counterparts. **Khokhar and Kush (2009)** in their study explained the performance of executives on different levels of emotional intelligence and provided a link

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between emotional intelligence and effective work performance. The findings of the study discovered that female executives having higher emotional intelligence showed better quality of work performance as compared to the male executive. **Cooper (1997)** has found the significant evidence that higher emotional intelligence levels were related to more flexible managers as they are able to understand the reasons behind stress and thereby plan ahead to avoid the resultant unconstructive effect of stress. **Mayer et al. (2004)** in their study recommended that emotional intelligence positively contributes to job performance when the maintenance of positive personal commitments is important. **Bhalla and Nauriyal (2004)** reported that emotional intelligence is extremely important in Indians as they have high affiliation need and emotional intelligence can lead to significant gain in productivity. **Quoidbach and Hansenne (2009)** investigated the relationship between emotional intelligence, performance, and causes in twenty three nursing teams in Belgium. Nursing team performance was measured at four different levels: job satisfaction, chief nursing executives rating, health care quality and turnover rate. Emotional parameter was also certainly correlated with group cohesiveness. **Myleen et al. (2009)** recommended that behaviors associated with extroversion and feeling preferences are closely associated with the presence of emotional intelligence. **Langley (2000)** explored whether emotional intelligence is a useful yardstick in measuring and understanding the promotion readiness of middle managers in a global organisation. Emotional intelligence may contribute to developed managers in the new century.

METHODOLOGY

The main objective of the study is to determine the construct reliability, convergent validity, and internal consistency of the Emotional Intelligence Scale in Indian Automobile Sector.

3.1 Participants and Sampling

The sample size for the study was consisted four hundred employees of Indian automobile sector. The researcher targeted four hundred respondents in total, from each ten companies working in Indian automobile sector. Out of forty respondents from each of the company, ten respondents were managers and thirty non managers. Personal variables like age, marital status, designation, education level, income level and work experience were included in the study. **Table 1** explains the distribution of sample.

Table 1: Respondent's Profile

Demographic Variables	Sub Group	Fréquency	Percentage
Company Name	Tata Motors	40	10
	Bajaj Auto Ltd.	40	10
	Hero Moto Corp Ltd.	40	10
	Imperial Auto Industries Ltd	40	10
	Escort Limited	40	10
	Maruti Suzuki India Ltd.	40	10
	New holland Fiat, Gr	40	10
	Ahresty india pvt.	40	10
	Jbc India Ltd Fbd	40	10
	Mahindra & Mahindra	40	10
	Total	400	100
Age (Years)	Up to 30 years	179	44.8
	31 to 40 years	127	31.8
	41 to 50 years	85	21.3
	51years and above	9	2.3
	Total	400	100
Gender	Male	385	96.3
	Female	15	3.8
	Total	400	100
Income (Lakhs)	Up to 5 lakh	168	42.0
	5 to 7.5 lakh	118	29.5

	7.5 to 10 lakh	92	23.0
	More than 10 lakh	22	5.5
	Total	400	100
Experience (Years)	0 to 5years	61	15.3
	5 to 10years	141	35.3
	10 to 15years	101	25.3
	16 to 20 years	52	13.0
	Above 20 years	45	11.3
	Total	400	100
Level of Education	Graduation	135	33.8
	Post Graduation	66	16.5
	Professional	70	17.5
	Any Others	129	32.3
	Total	400	100
Designation	Managers	100	25
	Non Managers	300	75
	Total	400	100

Source: Survey Data

3.2 Emotional Intelligence Instrument

Emotional Intelligence scale also called Bhattacharya Instrument on Emotional Intelligence (BEIS In.) developed by Bhattacharya in 2003. This scale was used in study to find out the level of emotional intelligence. A five point likert scale has been used 'never true' to 'always true' (never true, rarely true, sometimes true, usually true, and always true). A score of 5 for response of always true, 4 for usually true, 3 for sometimes true, 2 for rarely true, 1 for never true. The reversed score items were given reverse value. All constructs have higher cutoff alpha values more than .60 (Table 3). The high values of reliability and validity imply that the instruments used in this study are adequate.

DATA ANALYSIS

The data was analyzed using the Statistical Package for Social Sciences 18.0 and AMOS 18.0 software packages. The analysis of the study is presented in three parts as follow:

- The first part presents outcomes of the exploratory factor analysis on Emotional Intelligence Scale with the help of KMO value, Eigen value and item to total correlation.
- The second part presents the outcome of confirmatory factor analysis.
- In the third part, construct reliability and convergent validity values of the final scale are reported.

Factor analysis is used to check the discriminant validity. Because each variable was measured by multi-item constructs, factor analysis with varimax rotation was adopted to check the unidimensionality among items. Factor analysis is also used to understand the important factors of emotional intelligence. There were around 40 variables taken into consideration for the study which are grouped under 5 major heading or factors as follows: negative emotion, positive emotion, conflict and difficulty, goal orientation and skill & flexibility. The various statements were grouped under each factor, depending upon the maximum factor loading obtained (**Table 2**) in rotated matrix of factor analysis using SPSS 18 software package.

Table 2: Factor Loadings of Varimax Rotated Principal Components

	Component					Total variance Explained=62.847%	
	1	2	3	4	5	Eigen Value	% of Variance
EI1	.733	.035	.042	.022	-.068	7.850	19.245
EI2	.760	-.046	-.046	-.016	-.076		
EI3	.423	-.039	-.019	-.110	-.040		
EI4	.459	-.083	-.001	-.030	-.042		
EI5	.802	-.050	.005	-.137	.012		
EI6	.788	.027	.018	-.048	-.011		

EI7	.793	.065	.024	.090	.020		
EI8	.762	.008	.081	.038	-.036		
EI9	.761	.041	.042	.035	-.029		
EI10	.778	.017	.017	.064	.039		
EI11	.785	-.030	.005	.095	-.041		
EI12	.728	-.041	.044	.027	-.022		
EI13	.721	-.012	.089	.009	-.102		
EI14	-.022	.786	-.040	.065	-.069		
EI15	.008	.754	-.039	.044	-.059		
EI16	.046	.780	-.045	.052	.031		
EI17	.029	.800	-.019	.027	.025	6.259	15.358
EI18	-.047	.801	.043	.027	-.008		
EI19	-.002	.814	.056	.036	.009		
EI20	.000	.758	.100	.066	-.012		
EI21	-.033	.771	.084	-.016	-.024		
EI22	-.051	.802	-.007	.024	.043		
EI23	-.022	.328	-.001	.004	.047		
EI24	.033	-.005	.828	.046	.014		
EI25	.018	.059	.819	-.024	-.041		
EI26	.024	.049	.840	.011	-.051	4.186	10.630
EI27	.054	.024	.819	.024	.002		
EI28	.079	-.047	.809	-.093	.094		
EI29	.015	.022	.815	.054	-.019		
EI30	.035	.026	.347	-.093	.578		
EI31	-.243	-.043	-.083	.030	.853		
EI32	-.207	-.014	-.053	.005	.882	3.785	8.930
EI33	-.068	-.022	-.066	.035	.823		
EI34	.116	.006	-.053	.017	.744		
EI35	-.018	.047	.097	.407	.581		
EI36	-.058	.000	.001	.817	.029		
EI37	.008	.079	-.036	.790	.074	3.059	8.684
EI38	.111	.007	-.023	.788	.010		
EI39	-.057	.111	.023	.836	-.008		
EI40	.036	.065	.026	.832	.037		

Source : Survey Data

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.895
Bartlett's Test of Sphericity	Approx. Chi-Square
	10289.807
	df
	780
	Sig.
	.000

The Kaiser-Meyer-Olkin Measure of sampling adequacy for Emotional Intelligence scale was 0.895 which is more than 0.60 minimum values for good factor analysis. Its show that sample is adequate for the study and implies factor analysis for data reduction is effective. The Bartlett's Test of Sphericity for the measurement scale were significance at 0.000 is less than the assumed value ($p < 0.05$) which concludes that factor analysis is valid and supported the factor ability of the correlation.

Using the Principle Component Analysis five factors (Table 2) have been extracted based on Total Explained Variance (Eigen value over 1). Hence we conclude that the 40 variables can be reduced to five factors. Table 2 shows the % of variance and the total variance of the variable identified for the study. The five factors extracted together account for 62.84% of the total variance. So the number of variables is economized from 40 to only five factors, (thus loading only about 37.161% of the information contented) 62.84% is retained by the five factors extracted out of the 40 original variables. Factor loadings less than 0.5 (Ei3, Ei4, Ei23) were suppressed. Analysis was performed on 35 items that measured the components of Emotional Intelligence Scale. But some items (Ei30, Ei35) have the loading < 0.50 but item to total correlation is less than 0.03 so these items were dropped for further analysis. Finally 35 variables of Emotional Intelligence scale was measured for confirmatory factor analysis to know the construct validity and reliability. The rotated components matrix shows (Table 2) the factor loading of each item. Item no.Ei1 to Ei13 shows the first factor loading items which is grater then .05

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which is acceptable. Factor second is negative emotion which loading represent the column 2 by Ei14 to Ei23. Factor third loading represent by item Ei24 to Ei29. Forth factor is skill & flexibility loading represents item Ei30 to Ei35. Last factor is goal oriented that factor loading score represent by item no.Ei36 to Ei40. As seen in Figure 1, the measurement model of Emotional Intelligence Scale specifies the relations between observed and latent variables. The observed variables and the latent variables are represented by the boxes and the ellipses correspondingly. All loadings of items on each factor of Emotional Intelligence Scale were above 0.60 and significant (**Table 3**). The double-headed row represents the covariance, which also can be interpreted as correlation.

Table 3: Summary Statistics And Loadings Of Items

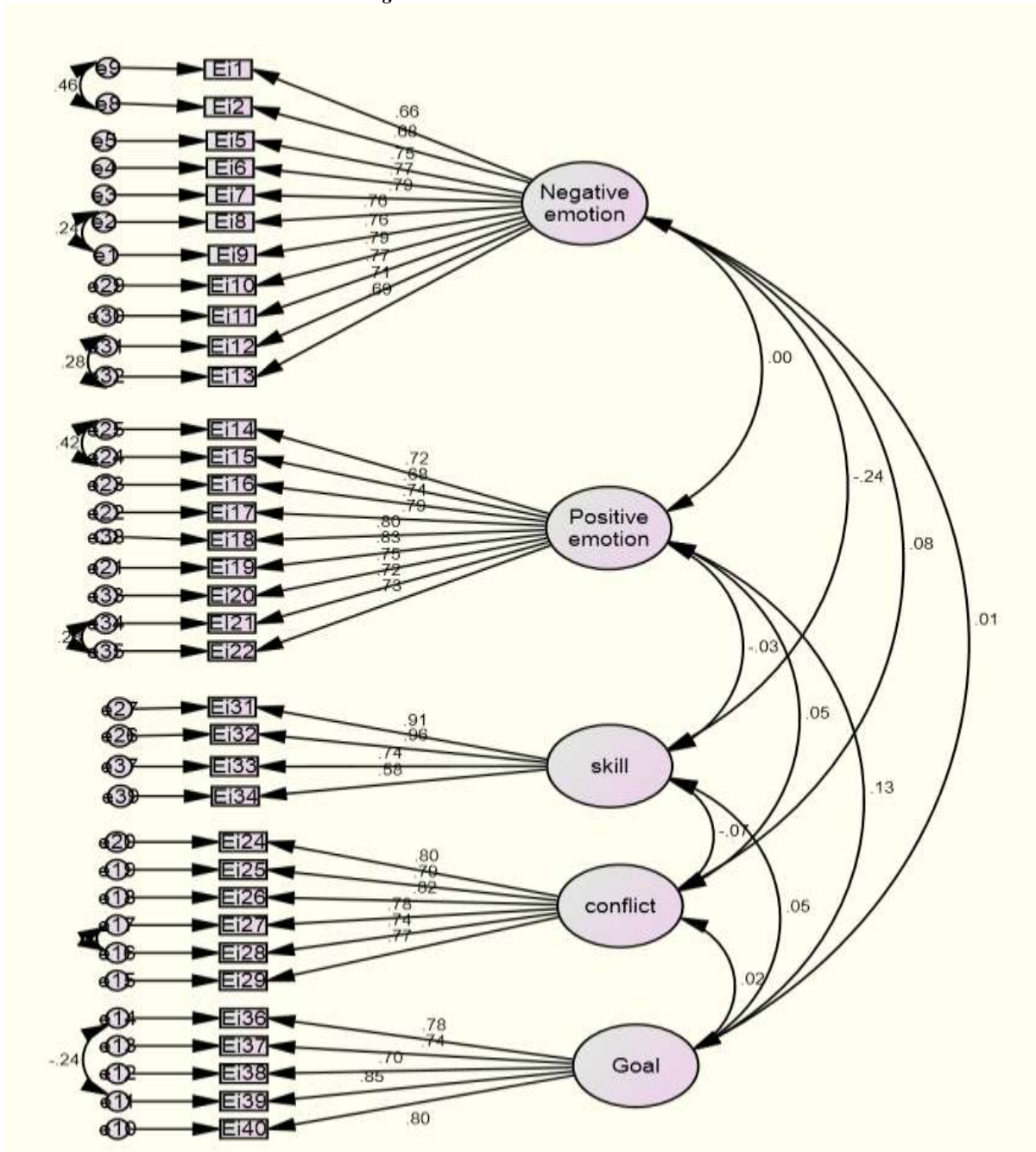
Constructs	Indicators	Loadings	Mean	Item-to-total correlation
Negative Emotion	Ei1	.66	2.89	.457
	Ei2	.68	2.44	.376
	Ei5	.75	2.42	.407
	Ei6	.77	2.65	.460
	Ei7	.79	2.84	.534
	Ei8	.70	2.76	.474
	Ei9	.76	2.70	.472
	Ei10	.79	2.84	.490
	Ei11	.77	2.70	.460
	Ei12	.71	2.80	.415
Positive Emotion	Ei13	.69	2.64	.416
	Ei14	.72	3.61	.322
	Ei15	.68	3.67	.323
	Ei16	.74	3.71	.380
	Ei17	.79	3.81	.378
	Ei18	.80	3.74	.342
	Ei19	.83	3.64	.395
	Ei20	.75	3.70	.384
	Ei21	.72	3.61	.343
	Ei22	.73	3.70	.339
Conflict and Difficulty	Ei24	.80	2.74	.303
	Ei25	.79	2.69	.388
	Ei26	.82	2.75	.301
	Ei27	.78	2.90	.319
	Ei28	.74	2.93	.382
	Ei29	.77	4.07	.391
	Ei31	.91	4.15	.336
Skill & Flexibility	Ei32	.96,	3.19	.312
	Ei33	.74	3.65	.387
	Ei34	.58	3.93	.391
	Ei36	.70	4.03	.358
	Ei37	.74	3.95	.332
Goal Oriented	Ei38	.70	3.74	.348
	Ei39	.85	4.05	.320
	Ei40	.80	3.98	.366

Source : Survey Data

4.2 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is a part of SEM analysis. Confirmatory factor analysis plays the role of validating and finding the reliability of any measurement in most social science studies (Harrington, 2009).Thompson (2004) suggests that before conducting an analysis of structural equation modeling, researchers should first go for analyze measurement models, since measurement models can correctly reflect the constructs of a study. The reduction of variables in the CFA measurement model was modified using the two-stage model by Kline (2005). The measurement model was examined before conducting the evaluation. The researcher used AMOS 18.0 to perform CFA. The measurement model of Emotional Intelligence Scale contained both observed (measured) variables and latent constructs. The CFA structure in (Figure 1) comprises five factor of emotional intelligence (EI) Negative Emotion (NE), Positive Emotion (PE), conflict and difficulty (CD), skill & Flexibility (SF) and Goal Oriented (GO). Each EI factor is measured by observed variables, the reliability of which is influenced by random measurement error, as indicated by the related error term. Each of these observed variables is regressed onto its respective factor.

Figure 1: Final Measurement Model



First order CFA model for Emotional Intelligence (Developed by researcher)

Note: Negative Emotion = Negative Emotion, Positive Emotion= Positive Emotion, Conflict= Conflict and difficulty, Goal = Goal Orientation, Skill =Skill & Flexibility

Item Ei1 to Ei40 represent observed variables, e1 to e35 represent error variance, Single headed arrows show factor loading, and Double headed arrows depict correlation among factors

Finally, the five factors are shown in Figure 1 to be inter- item correlated. In order to attain model fit, fit statistics tests like chi-square test, the comparative chi-square (CMINDF: the chi-square/degree of freedom), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), and Root Mean Square of Error Approximation (RMSEA) were chosen. The acceptable criterion for model fit shown in **Table 4**.

Table: 4 Model Fit Indices of Final Measurement Model

Index	Recommended value	Model fit indices
GFI	Greater than .85	.871
CMIN/DF	Less than 5	1.856
CFI	Greater than .9	.946
TLI	Greater than .9	.941
RMSEA	Less than .1	.046

Note: chi square; df= degree of freedom; CFI= comparative-fit index; TLI= Tucker Lewis index; CFI= comparative fit index; RMSEA= root mean square error of approximation.

4.3 Model Fit Indices

Goodness-of-Fit Index (GFI): The GFI measures how much better the model fits compared with no model at all (Joreskog & Sorbom, 1989). It is a non statistical measure ranging from 0 (poor fit) to 1 (perfect fit). Although higher values be a sign of a better fit, no threshold levels for acceptability have been established.

Root Mean Square Error of Approximation (RMSEA) The RMSEA takes into account the error of approximation in the population. It is a measure of discrepancy per degree of freedom.

Model Fit Indices to Improve the Model Fit: The AMOS output shows that MI table in which the largest MI value of e8 and e9 i.e. 84.587 and par change value is 0.229. That suggests that chi square value will go down at least 84.587 points by adding error covariance between the e8 and e9 items. However, e1 and e2 and e31 and e32 are on the same factor negative Emotion (**Figure1**).

Though, after modification five factor measurement model result shows that Chi square value now reduced to 1114.022 and p- value=0.000, CMIN/df=2.037, TLI= 0.928, CFI= 0.934, GFI= 0.856, RMSEA=0.051. These results displayed a comparatively better model fit from previous goodness of fit results. Third analysis results from CFA that Chi square value now reduced to 1021.265 and significant at 0.001, CMIN/DF=1.874, TLI= 0.939, CFI= 0.944, GFI= 0.870, RMSEA=0.047 which reflect a close model fit. These values are all in good fit range and reduced model with 35 variables best defined the overall good model fit.

4.4 Final Measurement Model

The final five factor measurement model test presented a overall very good model fit on 35 variable of Emotional Intelligence Scale model fit result (**Table 4**) is (CMIN/DF = 1.856, RMSEA = .046, CFI = .946, GFI = .871, TLI = .941, df = 1008, P< .001), except chisquare, which is often reported as significant because of sample size and strict assumptions (Bagozzi et,al. 1980).

4.5 Reliability and Validity of Emotional Intelligence Scale

The five constructs of measurement model had also shown good internal consistency all cronbach alpha and CR value more than 0.8. Similarly, the values of Average Variance Extracted (AVE) are greater than 0.5 and the CR greater than AVE which is good sign of convergent validity. Discriminant validity is also good because value of MSV and ASV are less than AVE (Table 5) suggested by Hair et al. 2006. So the indices of reliability and validity supported the measurement model.

Table: 5 Indices of Reliability & Construct Validity

	Cro-Bach alpha	CR	AVE	MSV	ASV	Positive emotion	Negative emotion	Goal	conflict	skill
Positive emotion	0.928	0.922	0.568	0.016	0.005	0.754				
Negative emotion	0.939	0.930	0.548	0.055	0.016	-0.002	0.740			
Goal Oriented	0.878	0.882	0.601	0.016	0.005	0.126	0.010	0.775		
Conflict & Difficulty	0.906	0.905	0.615	0.007	0.004	0.053	0.082	0.016	0.784	
Skill & flexibility	0.850	0.879	0.652	0.055	0.016	-0.027	-0.235	0.052	0.074	0.808

Note: Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and Average Shared Variance (ASV)

CONCLUSION

The result of exploratory and confirmatory factor analysis of the five factor model with 35 items of the Emotional Intelligence Scale had a good fit indices and also shown good reliability and validity score. The measurement model consisted of 40 items in starting, which have been reduced to 35 items because of low loading factors value and low Item to total correlation score. Finally 35 items were well loaded into the five constructs that include negative emotion, positive emotion, conflict and difficulty, goal orientation and skill & flexibility. Standardized regression weight (Table 6) of all the observed variables are also higher than 0.66. Hence, it is concluded that the Emotional Intelligence Scale had a good latent constructs. The result of Exploratory Factor Analysis and Confirmatory Factor Analysis (first order) for this study has shown the evidence of the reliability and the validity of the Emotional Intelligence Scale. The acceptable model fit (Bacon, 1995) was achieved since all the chosen fit statistics meet the requirement. Emotional Intelligence first order five factors model (measurement model) from this study can be a starting point for further research. Since all the factors have good acceptable reliability and validity value, each factor can be measured separately depending on the nature of the study. Therefore, the Emotional Intelligence Scale can be replicated in further research with second order level.

Table 6: Standardized Regression Weights

	Estimate
Ei9 <--- Negative_emotion	.761
Ei8 <--- Negative_emotion	.760
Ei7 <--- Negative_emotion	.793
Ei6 <--- Negative_emotion	.766
Ei5 <--- Negative_emotion	.748
Ei2 <--- Negative_emotion	.680
Ei1 <--- Negative_emotion	.662
Ei40 <--- Goal	.798
Ei39 <--- Goal	.847

	Estimate
Ei38 <--- Goal	.702
Ei37 <--- Goal	.745
Ei36 <--- Goal	.775
Ei29 <--- conflict	.768
Ei28 <--- conflict	.745
Ei27 <--- conflict	.776
Ei26 <--- conflict	.818
Ei25 <--- conflict	.792
Ei24 <--- conflict	.803
Ei19 <--- Positive_emotion	.829
Ei18 <--- Positive_emotion	.801
Ei17 <--- Positive_emotion	.795
Ei16 <--- Positive_emotion	.738
Ei15 <--- Positive_emotion	.683
Ei14 <--- Positive_emotion	.721
Ei32 <--- skill	.955
Ei31 <--- skill	.905
Ei10 <--- Negative_emotion	.789
Ei11 <--- Negative_emotion	.774
Ei12 <--- Negative_emotion	.706
Ei13 <--- Negative_emotion	.687
Ei20 <--- Positive_emotion	.755
Ei21 <--- Positive_emotion	.718
Ei22 <--- Positive_emotion	.730
Ei33 <--- skill	.740
Ei34 <--- skill	.675

Source : Survey Data

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