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TALENT TURN OUT WITH SPECIAL REFERENCE TO CIVIL ENGINEERS PERSPECTIVE - RELIABILITY OF THE INSTRUMENT USING PRINCIPAL COMPONENT ANALYSIS CRONBACH'S ALPHA AND OMEGA

Er. B. Ravinder[1], Dr. A.B. Saraswathi[2]

[1]*Research Scholar, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, Andhra Pradesh, India. Assistant Professor, National Institute of Construction Management and Research - NICMAR, Hyderabad, India.*

[2]*Assistant Professor, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, Andhra Pradesh, India*

Abstract

The study has been carried to generate an empirical data on the reliability of the talent turn out with special reference to civil engineer's perspective questionnaire and a survey has been administered in civil engineering community in India. The reliability of the questionnaire has been tested with Cronbach's alpha and Principal Component Analysis (PCA) by engaging the Statistical Package for the Social Sciences (SPSS). The questionnaire is 5-point likert's scale survey consisting of 56 items. According Bartlett's test of sphericity there is sufficient and significant correlation in the data for factor analysis (Chisq(1540) = 3490.55, p < 0.001). The principal component analysis and Scree plot reveals that there are 4 factors (constructs) that can be constructed from the 56 questions. However, these 4 factors can only explain 44% of the variation in the data. In addition to Cronbach alpha test, the data has been investigated with reference to the omega reliability concept. During the study of test out come of both Cronbach alpha as well as Omega Work Environment and Nature of Work, Communication and Motivation, Project Site Location factor's scale found to be weak based on Cronbach's reliability criterion but the same is acceptable as per Omega reliability criterion, where as Performance Appraisal system, Promotion and Carrier Development factor's scale found to be weak with reference to Cronbach's as well as Omega reliability criterion.

Keywords: Reliability, Principal Factor Analysis, Cronbach's Alpha, Omega

1. Introduction

Employee turnout has been found to be challenging for employers even though employers are creating the employment for various grades of prospective qualified and employable people of civil society. B.Ravinder, Dr. A.B. Saraswathi (2020) in their paper work titled "Talent Turn Out with Special

Reference to Civil Engineers Perspective - A Literature Review" it is concluded that the reasons for talent turnout is varying with respect of employment market opportunities, employer's sustainability, employer's consideration of their employee wants and needs as well as employees expectation, employees commitment and responsibility towards their family, employee's age. Exploratory research has been adopted, it leads for an explanation of why and how the relationship between two aspects of situation and to confirm the possibility of further study a pilot study has been conducted. Principal factor analysis is a variable deduction method and it is engaged when variables are extremely matchup. As per IBM knowledge center the high alpha value indicates very high reliability and in general alpha ranges between 0 and 1. Pallant (2000) has developed a psychometric evaluation to measure the one's aptness to manage their internal states and modest contact of insensitive events on their feeling and he has culminated that value of alpha equal to 0.7 and higher is suggestible for a instrument with ten or more variables. Leslie A. Baxter, Earl R. Babbie (1990) in their book "The Basics of Communication Research" Validity has been referred as the testing of real meaning of concepts under consideration in a effective manner, Ghazali & Sufean (2016) in their book "Metodologi penyelidikan dalam pendidikan: amalan dan analisis kajian" validity has been defined as an relevance, veracity, declamation and practicality instrument that admits data to be conjectured. Gjalt-Jorn Y.Peters (2014) in his paper titled "The alpha and the omega of scale reliability and validity" it is concluded that the Cronbach's alpha is based on repeated measurements but not practiced, hence unconnected to a scale's intramural uniformity and a flaw appraise of its constancy and this issue shall be addressed by available alternative such as Greater Lower Bound or Omega. Klaas Sijtsma (2009) in the work of a paper titled "On the Use, The Misuse, And the Very Limited Usefulness of Cronbach's Alpha" it is concluded as alpha is not internal consistency measurement, it is not a measure of degree of uni-dimensionality, moderate to high alpha values indicates one-dimensional or multidimensional data.

2. Objectives:

The objectives this study is

a) To investigate the validity of the scale and responses with respect to Alpha as well as Omega.
b) To investigate the reliability of the scale and responses with respect to Alpha as well as Omega.

3. Methodology of the Study

Sample and Data Collection: Indian civil engineering community has been considered as a universe and random sample has been collected. The data is being collected directly from the engineers, it shall be considered as primary data and experience of the respondents ranging one year to fifteen only. The respondents are of married and non-married category as well as working on site office or in off-site offices. This pilot study has been carried during February 2020 to April 2020 and respondents have shared their opinions via e-mails and few of them over telephonic communication. The number of respondents was sixty-two in number, couple of engineers were holding the post graduation certificates, rest of the engineers are of graduated from universities of India.

Instrument: To measure the variable it is classified in to two parts the part-A was of demographics, the second part-B was of items/variables. The flow of questionnaire was systematically developed and to respond in excitement few questions are constructed with negative expression, while all are of with positive expression. The question expression was in a simple language, which is understandable by every respondent. The part-B contains 56 variables which covers 12 related constructs of independent variables. American educator and organizational psychologist Rennis Likert in 1932 have attempted in further developing the measuring scale in social science research through a standardized category in survey

questionnaires. Gwinner (2006) in his work attempted to bring in to six pointer scale but survey has resulted to have five pointer scale. A five-point Likert scale has been engaged to have responses from respondents and the scale is defined as Strongly disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly agree (5).

Normalization: Normalization is to bring the data values in to a range between 0 and 1. Statisticians used work on "min-max" normalization and "unity" normalization.

Standardization: It is a feature where in the data will transform to mean as zero and standard deviation as 1 (i.e. Unit standard deviation)

Standardized Measurement = {(original measurement – mean of the variable)/ (standard deviation of the variable)}

4. Data analysis:

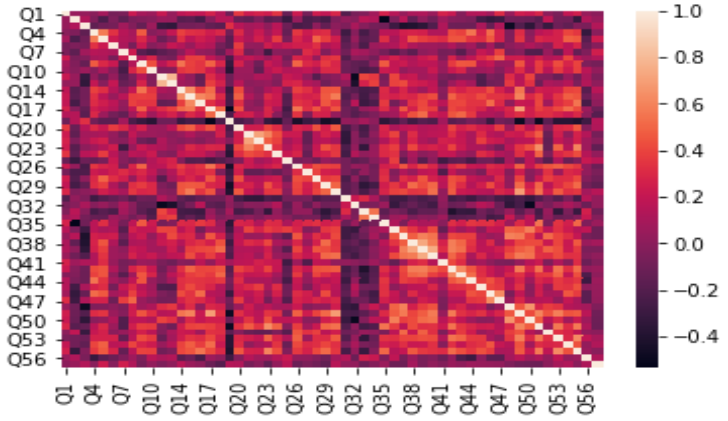
Factor analysis: Principle factor analysis and Cronbach's Alpha has been engaged to examine the data (Table 1)

Table 1:

S.No.	Purpose	Statistical Measures Used
1	Construct Validity	Factor Analysis: Principle factor analysis
2	Reliability	Cronbach's Alpha

The data has been scrutinized by engaging the SPSS package. In factor analysis items not exceeding 0.4 factor loadings were deleted. Eigen values more than 1 were drawn out from retained.

Principle factor analysis: The correlations between variables has been presented in Heat Map (Graph 1)



Graph 1: Heat Map showing correlations between the variables

Inference on correlations: From the graph 1, it is observed that there is moderate to high correlations among items/variables.

Table 2: Sphericity of data matrix

S.No.	Description	Value
1	Chisq	3490.55
2	p.value	1.36447e-152
3	Df	1540

Inference: As per Bartlett's test of sphericity there is a sufficient and significant correlation in the data for factor analysis (Chisq(1540) = 3490.55, p < .001).

Component Loadings: Referring to Rotated Component Matrix, a total of thirty-five item/variable were eliminated due to non-satisfaction of least factor loading of 0.4 or high, it the variables could not contribute to simple factor structure, rest of the items/variable retained (Table 3). One item was discarded due to all responses found to remain same.

Table 3: Component Loadings referring to principal component analysis extraction and with Varimax rotation method.

S.No.	Question	Component Loading				Uniqueness
		1	2	3	4	
1	Q3				-0.531	0.663
2	Q8	0.503				0.739
3	Q9	0.521				0.622
4	Q10	0.4				0.794
5	Q11				0.729	0.441
6	Q12				0.753	0.42
7	Q13	0.704				0.479
8	Q14	0.661				0.45
9	Q17		0.58			0.564
10	Q18	-0.559				0.562
11	Q19	0.51				0.639
12	Q20			0.782		0.382
13	Q21			0.654		0.558
14	Q22			0.787		0.326
15	Q29	0.581				0.513
16	Q33				0.422	0.748
17	Q42		0.747			0.365
18	Q45	0.596				0.55
19	Q46	0.531				0.672
20	Q47				0.665	0.485
21	Q53	0.659				0.523

Component Statistics: The compilation results presented in Table 4, Table 5, Table 6, and Table 7.

Eigenvalues: Eigen values are alternate name of characteristic roots. It explains that a particular factor shall explain by a percentage, remaining percentage shall be by other factor/s.

Table 4: Summary of Loading and Variance

Component	SS Loadings	% of Variance	Cumulative %
1	8.28	14.79	14.8
2	5.95	10.63	25.4
3	5.38	9.60	35.0
4	5.29	9.45	44.5

Table 5: Summary of Variance

S.No.	Description	RC1	RC4	RC3	RC2
1	SS loadings	8.57	6.00	5.26	5.07
2	Proportion Variance	0.15	0.11	0.09	0.09
3	Cumulative Variance	0.15	0.26	0.35	0.44
4	Proportion Detailed	0.34	0.24	0.21	0.20
5	Cumulative Fraction	0.34	0.59	0.80	1.00

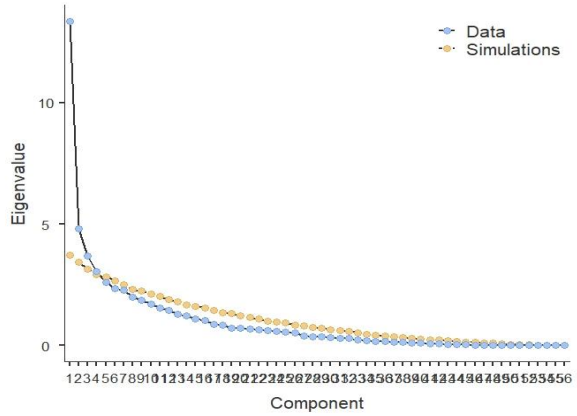
Table 6: Summary of component correlations

S.No.	Description	RC1	RC4	RC3	RC2
1	RC1	1.00	0.44	0.37	0.03
2	RC4	0.44	1.00	0.24	0.03
3	RC3	0.37	0.24	1.00	0.05
4	RC2	0.03	0.03	0.05	1.00

Table 7: Summary of Observations

S.No.	Observation
1	Complexity of mean item = 1.9
2	Four components are good enough for testing hypothesis.
3	The root mean square of the residuals (RMSR) is 0.09
4	The empirical chi square 1527.93 with prob < 6.5e-05
5	Fit based upon off diagonal values = 0.88

Scree Plot: To deduce the factors and to keep them back in the principal component analysis (PCA) a Screen test has been carried out and a Scree plot has been generated. This Scree plot is ordering eigen values from largest to smallest, hence a elbow has been observed in Scree plot. The factors or component/s left to the elbow shall be retained as they are being significant. The principal component analysis and scree plot as shown in Graph 2 reveal that there are 4 factors (constructs) that can be extracted from the 56 questions. However these 4 factors can only explain 44% of the variation in the data.



Graph 2: Scree plot of the data

Reliability analysis: The summary of reliability analysis of factor/construct wise presented in Table 8

Table 8: The summary of reliability of construct/s

S.No.	Construct/Factor	Cronbach	Omega
1	Work Environment and Nature of Work	Not Reliable	Moderatley Reliable
2	Relationships with seniors and colleagues	Reliable	Reliable
3	Communication and Motivation	Not Reliable	Moderately Reliable
4	Training Programme	Reliable	Reliable
5	Performance Appraisal system	Not Reliable	Not Reliable
6	Pay/Compensation	Reliable	Reliable
7	Promotion and Carrier Development	Not Reliable	doubtful
8	Welfare Facility	Reliable	Reliable
9	Job Security	Reliable	Reliable
10	Management Style in Grievance Handling	Reliable	Reliable
11	Work Life Balance	Reliable	Reliable
12	Project Site Location	Not Reliable	Reliable

5. Conclusion:

Validity and reliability test have been performed for Alpha as well as for Omega. The scale is found to be valid, responses found to reliable and few variables are required to be eliminated. Work Environment and Nature of Work, Communication and Motivation, Project Site Location factor's scale is weak based on Cronbach's reliability criterion but it is acceptable as per Omega. Performance Appraisal system, Promotion and Carrier Development factor's scale is weak based on Cronbach's as well as Omega reliability criterion. Scree plot indicates that four constructs are good enough to explain 44% of the variation in the data. Based on this conceptual frame work will be constructed.

6. Further Study:

Based on the above findings the conceptual frame work proposed to be developed and final study proposed to be carried out.

7. Questionnaire (Part-B):

Under mentioned variables/questions were part of the questionnaire.

a. Work is challenging one.
b. Flexible Working hours
c. Interval is not possible during the work hours.
d. Management provides required tools and plants
e. Satisfaction the safety measures are provided.
f. Lighting during the nights quite satisfactory.
g. Physical labour weariness by the end of the day work.
h. Mental weariness by the end of the day work.
i. Ideas are considered while making the decision/s.
j. Boss is not biased and impartial.
k. Participation is welcomed.
l. Superiors are approachable.
m. Superiors are quite competent enough to guide.
n. Colleagues in the organization are friendly.
o. The colleagues are helpful.
p. Superiors motivates me to achieve the organization goal.
q. Superiors motivates me to increase the productivity.
r. There is a lack of Communication within this organization.
s. Work assignments are explained very clearly.
t. Training Provided on need basis.
u. Job performance after training programme has been improved.
v. The method and techniques of Performance evaluation by organization is satisfactory.
w. The appraisal policy of my organization helps in improving in individuals performance.
x. The personal biasness never made any influence on performance appraisal.
y. Wages of the organization is at par with the wages in the Industry.
z. Wages are paid in time on a fixed date.
aa. Remote allowances are extended.
bb. Satisfied with the allowances provided by the organization.
cc. Employees are rewarded for the innovative ideas and special contribution.
dd. Individuals are given promotions over a fixed time interval.
ee. Individuals are promoted, when they earn higher qualification.
ff. Individuals are promoted, if they demonstrate significant achievements.
gg. Individuals are promoted, when they contribute in high returns.
hh. Individuals are promoted, prior to assigning the complex. jobs/individual responsibility towards a team.
ii. Individuals are Satisfied with the promotion polices of the organization.
jj. The organization has adequate transport facility.
kk. Employees are satisfied with well laid medical benefit policy, in the organization.
ll. Family benefits are provided by the company.
mm. Employees are satisfied with the available refreshment facility at the organization.

nn. Employees are given rest room, which is maintained neatly.
oo. Lunch room is provided which is good enough.
pp. Vehicle parking lot is available.
qq. Job security is based on one's performance.
rr. Job security is based projects available to the organization.
ss. To secure the job one must be prepared to relocate at any point of time.
tt. To secure one must be flexible in discharging duties any type (Real/Infra) projects.
uu. One given due recognition in the management decisions.
vv. Employees are satisfied with decision making standards and policies.
ww. The grievance handling system and procedure is effective.
xx. Employees are able to communicate freely one's grievance.
yy. One would work with this organization.
zz. Employee work life is meaningful.
aaa. Work assigned is valuable in attaining the organization goals and vision.
bbb. Adequate opportunity to explore one's ability.
ccc. Employees prefer to work on remote project location/office, away from social habitation.
ddd. Employee prefer to work on project location/office, which are very near to social habitation.
eee. Employees prefer to work near to their home.

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