MSP Research Note

CLQ Reliability and Validity

Introduction

This paper describes the reliability and validity of the CLQ. The focus is mainly on the normative questionnaire because we have accumulated more data on CLQn, and because there is a lack of consensus about how to analyse ipsative instruments such as CLQi. The strengths and limitations of ipsative measurement are discussed by Baron (1996).

Evidence for the reliability and validity of CLQn is presented against some of the key the criteria in the EFPA Review Model for the Description and Evaluation of Psychological Tests. The EFPA Review Model was produced to support and encourage the process of harmonising the reviewing of tests. It provides a standard set of criteria to assess the quality of tests. These cover the common areas of test review such as norms, reliability and validity.

Reliability

This section covers internal consistency reliability – that is, the extent to which tests or procedures assess the same characteristic, skill or quality. It is a measure of the precision between the observers or of the measuring instruments used in a study.

Cronbach's Coefficient Alpha is a frequently used measure of internal consistency reliability. It gives the average of the correlations between all possible pairs of items on a scale. Tables 1-2 present internal consistency estimates for the normative and ipsative versions of the questionnaire based on this measure. The CLQn

questionnaires have median scale reliabilities in the range defined as adequate to good by the EFPA Review Model.

The median reliability estimates for the CLQ are 0.71 for CLQn and 0.81 for CLQi. The alpha calculation for CLQi is based on data from the test development questionnaire prior to ipsatization because a standard reliability calculation is inappropriate with a forced-choice format with small numbers (under 30) of scales or where the scales have strong positive correlations (Baron, 1996).

The Standard Error of Measurement (SEm) provides an error band around a score. The SEM allows us to put confidence bands around the scores of individual test takers. If one standard error is added to a score and one standard error is subtracted from it, a range is created within which we can be 68% certain the true score falls. If two standard errors are added to the score and two standard errors are subtracted from it, a wider range is created within which we can be 95% certain that the true score falls.

The CLQn scale SEms range from 1.9 to 2.7 with a mean SEm of 2.3. This is equivalent to a primary scale sten score SEm of approximately 1. In other words, there is a 68% likelihood that the person's true score on one of the primary competency scales will lie 1 sten either side of the observed score.

Table 1. Internal consistency reliabilities for CLQn (N = 3,166)

Scale	Alpha	Mean	SD	Raw Score SEm
M1: Initiative	0.66	31.85	3.87	2.26
M2: Risk Taking	0.66	26.99	4.07	2.37
M3: Creativity & Innovation	0.73	30.12	4.21	2.19
M4: Adaptability	0.70	31.46	3.91	2.14
P1: Analytical Thinking	0.71	30.73	4.12	2.22
P2: Decision Making	0.73	29.92	4.41	2.29
P3: Planning	0.78	27.21	5.34	2.50
P4: Quality Management	0.66	30.24	4.23	2.47
I1: Communicating	0.77	29.92	5.01	2.40
I2: Listening & Supporting	0.78	32.21	4.00	1.88
I3: Relating & Networking	0.75	30.04	5.14	2.57
I4: Teamwork	0.75	32.33	4.10	2.05
R1: Achieving Goals	0.60	30.03	4.28	2.71
R2: Customer Focus	0.69	32.37	3.77	2.10
R3: Business Awareness	0.64	29.78	4.20	2.52
R4: Learning Orientation	0.66	32.39	3.76	2.19
L1: Authority & Influence	0.78	32.16	4.67	2.19
L2: Motivating & Empowering	0.64	29.48	3.48	2.09
L3: Developing Others	0.74	32.52	4.05	2.07
L4: Coping with Pressure	0.71	28.90	4.38	2.36

Table 2. Internal consistency reliabilities for CLQi (N = 968)

Scale	**Alpha**	Mean	SD	Raw Score SEm
M1: Initiative	0.82	18.64	3.79	1.61
M2: Risk Taking	0.83	19.46	3.98	1.64
M3: Creativity & Innovation	0.74	19.85	3.75	1.91
M4: Adaptability	0.72	19.46	3.71	1.96
P1: Analytical Thinking	0.83	20.21	4.33	1.79
P2: Decision Making	0.82	19.75	3.72	1.58
P3: Planning	0.86	19.38	4.00	1.50
P4: Quality Management	0.85	18.84	3.59	1.39
I1: Communicating	0.80	19.46	3.76	1.68
I2: Listening & Supporting	0.83	18.42	4.41	1.82
I3: Relating & Networking	0.79	19.22	4.21	1.93
I4: Teamwork	0.73	19.47	4.01	2.08
R1: Achieving Goals	0.84	18.24	3.69	1.48
R2: Customer Focus	0.83	18.22	3.90	1.61
R3: Business Awareness	0.82	18.63	3.46	1.47
R4: Learning Orientation	0.80	19.19	3.42	1.53
L1: Authority & Influence	0.76	18.43	4.03	1.97
L2: Motivating & Empowering	0.80	19.25	3.48	1.56
L3: Developing Others	0.76	19.13	4.09	2.00
L4: Coping with Pressure	0.73	17.71	3.86	2.01

Validity

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the measure, validity is concerned with whether the instrument measures what it sets out to measure. There are four types of validity.

Face validity is concerned with how the instrument appears. Criterion related validity demonstrates the accuracy of the measure by comparing it with other measures, for example, job performance ratings. Construct validity seeks agreement between a theoretical concept and the measuring device. Construct validity can be broken down into convergent validity and discriminate validity. Convergent validity is the agreement among ratings, gathered independently of one another, where measures should be theoretically related. Discriminate validity is the lack of a relationship among measures that should not be related. Finally, content validity is based on the extent to which a measure reflects the domain of content.

This section focuses on the construct and criterion validity of the CLQ. The evidence for construct validity is based on information about CLQ scale intercorrelations, factor analysis of CLQn and a study of the relationship between CLQn and the Emotional Competence Framework. The evidence for criterion validity is based on analysis of the relationship between CLQn scores and job performance ratings from 5,515 respondents in the standardisation sample. The evidence for face and content validity is based on the general overlap between the CLQ competency framework and other generic management competency frameworks.

Intercorrelations

Tables 3 and 4 show the intercorrelations of CLQn and CLQi scales based on the standardisation samples. The correlations for the normative questionnaire range from –0.07 to 0.69 with a median correlation of 0.4 indicating a moderate degree of independence for the scales. We examined the pattern of correlations using factor analysis and identified three clusters of scales and it is in each of these clusters that you find the strongest scale intercorrelations (see Table 3 below).

The correlations for the ipsative questionnaire were lower ranging from –0.1 to 0.51 with a median correlation of 0.23 indicating a higher degree of independence for the ipsative scales. This is consistent with Baron (1996) who reports that ipsative scale intercorrelations are always lower than normative ones.

Factor analysis of CLQn

Principal components extraction with varimax rotation was carried out using SPSS on the CLQn scales with the 6,118 respondents from the standardisation sample. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.94. Three factors were extracted explaining 62% of the variance.

The SMCs indicated that the three factors were internally consistent and well-defined by the variables, and the variables were moderately well-defined by the factor solution. Communality values ranged from 0.44 to 0.75 with a median value of 0.62. With a cut of 0.45 for inclusion of a variable in interpretation of a factor, all the

variables loaded on at least one factor. Two of the variables, Learning Orientation and Achievement, loaded on two factors and can be described as “complex”.

Table 5 shows loadings of variables on factors, communalities and percents of variance and covariance, with variables ordered and grouped by size of loading to facilitate interpretation. Loadings under 0.45 (20% of variance) are omitted.

The first factor accounting for 24% of variance in the solution is made up 9 CLQ competencies, the majority of which are competencies to do with relating to and managing people. Accordingly, we have labelled this factor People.

Table 3. Intercorrelations of CLQn scales (n=6,118)

	M1: Initiative	M2: Risk Taking	M3: Creativity & Innovation	M4: Adaptability	P1: Analytical Thinking	P2: Decision Making	P3: Planning	P4: Quality Management	I1: Communicating	I2: Listening & Supporting	I3: Relating & Networking	I4: Teamwork	R1: Achieving Goals	R2: Customer Focus	R3: Business Awareness	R4: Learning Orientation	L1: Authority & Influence	L2: Motivating & Empowering	L3: Developing Others	L4: Coping with Pressure
M1: Initiative	1.00	0.40	0.60	0.42	0.39	0.59	0.36	0.43	0.56	0.42	0.44	0.35	0.49	0.52	0.52	0.64	0.69	0.36	0.57	0.51
M2: Risk Taking		1.00	0.53	0.22	0.06	0.33	-0.07	-0.06	0.38	0.07	0.14	0.00	0.13	0.16	0.22	0.32	0.34	0.18	0.24	0.24
M3: Creativity & Innovation			1.00	0.46	0.36	0.54	0.16	0.26	0.57	0.30	0.29	0.29	0.39	0.48	0.39	0.53	0.55	0.29	0.54	0.40
M4: Adaptability				1.00	0.33	0.38	0.19	0.26	0.33	0.50	0.30	0.50	0.17	0.52	0.25	0.48	0.37	0.43	0.49	0.46
P1: Analytical Thinking					1.00	0.42	0.53	0.55	0.38	0.40	0.13	0.32	0.37	0.47	0.48	0.47	0.39	0.32	0.45	0.47
P2: Decision Making						1.00	0.33	0.39	0.53	0.25	0.30	0.29	0.41	0.44	0.42	0.47	0.55	0.25	0.49	0.53
P3: Planning							1.00	0.62	0.20	0.36	0.21	0.26	0.32	0.34	0.48	0.39	0.31	0.26	0.33	0.36
P4: Quality Management								1.00	0.27	0.33	0.16	0.29	0.46	0.47	0.47	0.41	0.33	0.19	0.41	0.31
I1: Communicating									1.00	0.27	0.38	0.26	0.39	0.43	0.38	0.46	0.67	0.29	0.56	0.39
I2: Listening & Supporting										1.00	0.39	0.61	0.14	0.57	0.32	0.57	0.41	0.63	0.57	0.46
I3: Relating & Networking											1.00	0.46	0.22	0.33	0.29	0.39	0.54	0.37	0.40	0.36
I4: Teamwork												1.00	0.17	0.54	0.25	0.45	0.38	0.53	0.55	0.41
R1: Achieving Goals													1.00	0.35	0.51	0.38	0.45	0.08	0.37	0.25
R2: Customer Focus														1.00	0.44	0.57	0.49	0.46	0.65	0.46
R3: Business Awareness															1.00	0.51	0.47	0.30	0.43	0.41
R4: Learning Orientation																1.00	0.59	0.50	0.62	0.57
L1: Authority & Influence																	1.00	0.40	0.62	0.52
L2: Motivating & Empowering																		1.00	0.49	0.44
L3: Developing Others																			1.00	0.47
L4: Coping with Pressure																				1.00

Table 4. Intercorrelations of CLQi scales (n=968)

	M1: Initiative	M2: Risk Taking	M3: Creativity & Innovation	M4: Adaptability	P1: Analytical Thinking	P2: Decision Making	P3: Planning	P4: Quality Management	I1: Communicating	I2: Listening & Supporting	I3: Relating & Networking	I4: Teamwork	R1: Achieving Goals	R2: Customer Focus	R3: Business Awareness	R4: Learning Orientation	L1: Authority & Influence	L2: Motivating & Empowering	L3: Developing Others	L4: Coping with Pressure
M1: Initiative	1.00	0.32	0.27	0.30	0.23	0.37	0.24	0.27	0.21	0.16	0.19	0.13	0.51	0.29	0.14	0.27	0.40	0.11	-0.06	0.25
M2: Risk Taking		1.00	0.45	0.38	0.24	0.40	-0.10	0.09	0.08	0.20	0.03	0.19	0.36	0.09	-0.03	0.25	0.31	0.32	0.14	0.23
M3: Creativity & Innovation			1.00	0.35	0.19	0.40	0.07	0.18	0.23	0.23	0.04	0.22	0.31	0.25	-0.07	0.34	0.39	0.26	0.29	0.15
M4: Adaptability				1.00	0.29	0.42	0.13	0.24	0.26	0.27	0.12	0.39	0.33	0.24	0.19	0.41	0.28	0.40	0.23	0.27
P1: Analytical Thinking					1.00	0.36	0.35	0.39	0.28	0.05	0.05	0.25	0.33	0.31	0.37	0.27	0.22	0.28	0.10	0.20
P2: Decision Making						1.00	0.17	0.19	0.18	0.26	0.18	0.28	0.40	0.27	0.14	0.30	0.39	0.24	0.12	0.24
P3: Planning							1.00	0.41	0.25	-0.02	0.12	0.22	0.21	0.30	0.35	0.16	0.13	0.15	0.11	0.03
P4: Quality Management								1.00	0.28	0.10	0.10	0.18	0.29	0.33	0.30	0.28	0.12	0.23	0.22	0.13
I1: Communicating									1.00	0.08	0.11	0.21	0.15	0.25	0.08	0.21	0.23	0.21	0.23	0.17
I2: Listening & Supporting										1.00	0.40	0.32	0.03	0.22	0.11	0.23	0.07	0.33	0.46	0.32
I3: Relating & Networking											1.00	0.42	-0.04	0.29	0.12	0.13	0.18	0.17	0.20	0.24
I4: Teamwork												1.00	0.06	0.29	0.23	0.27	0.10	0.39	0.35	0.26
R1: Achieving Goals													1.00	0.13	0.16	0.28	0.42	0.21	-0.04	0.25
R2: Customer Focus														1.00	0.29	0.31	0.19	0.24	0.26	0.30
R3: Business Awareness															1.00	0.24	-0.02	0.11	0.11	0.19
R4: Learning Orientation																1.00	0.16	0.23	0.28	0.25
L1: Authority & Influence																	1.00	0.22	0.07	0.19
L2: Motivating & Empowering																		1.00	0.42	0.25
L3: Developing Others																			1.00	0.27
L4: Coping with Pressure																				1.00

The second factor accounting for 22% of variance is made up of 8 competencies covering Risk Taking, Innovation, Oral Communication, Authority/presence, Initiative, Decision Making and Achievement. This factor portrays a strategic manager who takes risks, brings about change and who is decisive, persuasive and charismatic. We have labelled this factor Strategy.

The third factor accounting for 17% of variance is made up of 5 competencies that appear to be to do with managing the business: Quality Focus, Planning, Analytical Thinking, Business Awareness and Achievement. Accordingly, we have labelled this factor Business.

Table 5. Pattern matrix for CLQn factor analysis principal components extraction, varimax rotation (n=6,188)

Scale	1	2	3	Communality
Listening & Supporting	0.84			0.75
Motivating & Empowering	0.83			0.70
Teamwork	0.82			0.70
Adaptability	0.71			0.59
Developing Others	0.64			0.66
Customer Focus	0.61			0.58
Relating & Networking	0.55			0.44
Learning Orientation	0.54	0.45		0.62
Coping with Pressure	0.50			0.46
Risk Taking		0.76		0.62
Innovation		0.75		0.64
Communicating		0.73		0.61
Authority & Influence		0.67		0.66
Initiative		0.66		0.69
Decision Making		0.61		0.60
Achieving Goals		0.56	0.52	0.58
Quality Management			0.84	0.73
Planning			0.82	0.72
Analytical Thinking			0.64	0.59
Business Awareness			0.58	0.56
Percent of variance	23.94	21.48	16.98	
Percent of covariance	38.37	34.42	27.20	
Factor label	People	Strategy	Business	

Relationship between CLQn and Emotional Competence Framework (ECF)

A study of the relationship between the CLQn and the Emotional Competence Framework (ECF) was conducted to establish whether the CLQn measures competencies similar to those assessed by the ECF. The ECF is a generic competence framework distilling findings from a range of recognised academic and

government sources. We constructed an expanded questionnaire with marker items drawn from the ECF. One hundred and ninety two respondents completed this questionnaire. Table 6 shows that correlations between CLQn scales and the markers ranged from 0.51 to 0.88 with a median correlation of 0.77. A median correlation above 0.75 is classified as an excellent construct validity rating by the EFPA Review Model.

Table 6. Correlations of CLQn and Emotional Competence Framework markers (n=192)

Scale	Correlation	ECF Marker
M1: Initiative	0.83	Initiative
M2: Risk Taking	0.66	Initiative
M3: Creativity & Innovation	0.81	Change catalyst
M4: Adaptability	0.76	Adaptability
P1: Analytical Thinking		No equivalent scale
P2: Decision Making	0.70	Self-confidence
P3: Planning	0.51	Collaboration and cooperation
P4: Quality Management	0.86	Conscientiousness
I1: Communicating	0.81	Influence
I2: Listening & Supporting	0.82	Empathy
I3: Relating & Networking	0.74	Building bonds
I4: Teamwork	0.80	Team capabilities
R1: Achieving Goals	0.77	Achievement drive
R2: Customer Focus	0.88	Service orientation
R3: Business Awareness	0.78	Political awareness
R4: Learning Orientation	0.81	Accurate self-assessment
L1: Authority & Influence	0.70	Self-confidence
L2: Motivating & Empowering	0.74	Leadership
L3: Developing Others	0.72	Developing others
L4: Coping with Pressure	0.75	Self-control

All correlations significant at the 0.01 level

Correlation between CLQn and job performance ratings

Evidence that CLQn scores are positively related to job performance comes from analysis of information gathered from respondents in the standardisation sample. Respondents were asked to rate their performance over the last twelve months using a 4-point scale (excellent, good, satisfactory, poor). They were also asked to say how their line manager had rated their performance using the same 4-point scale. Five thousand five hundred and fifteen respondents completed the two rating scales and the sum of the two ratings was used as a single combined indicator of job performance.

We used standard multiple regression to explore the relationship between the single combined indicator of job performance as the dependent variable and different types of CLQn scores as independent variables. Three separate investigations were

carried out using as independent variables i) CLQn primary scale scores, ii) key factor scores and iii) the factor analysis (FA) factor scores. All three investigations furnished evidence for the criterion validity of the CLQn but correlations were stronger when key factor or FA factor scores were used.

There were statistically significant correlations between the twenty CLQn scale scores and job performance ratings ranging from 0.07 to 0.32 with a median correlation of 0.2. There were stronger correlations with job performance ratings, however, when key factor and FA factor scores were used. The correlations between the five CLQn key factors and job performance ranged from 0.29 to 0.34 with a median correlation of 0.33. The correlations between the three FA factor scores and job performance ranged from 0.26 to 0.31 with a median correlation of 0.29. The EFPA Review Model guidance to reviewers on overall ratings of criterion-related validity describes median correlations between 0.20 and 0.35 as “adequate”.

Table 7 presents the results from regression of CLQn key factor scores on job performance ratings. It displays the correlations between the variables, the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (Beta), the semi-partial correlations (Unique) and R, R^2 and Adjusted R^2. R for regression was significantly different from zero, F (5, 5509) = 187.64, $p < 0.001$. Altogether, 15% of the variability in job performance ratings was predicted by knowing the scores on the CLQn key factors.

Table 7. Regression of CLQn key factor scores on job performance ratings (n=5,515)

	Combined Assessment	Managing Change	Planning & Organising	Interpersonal Skills	Results Orientation	Leadership	B	Beta	Significance	Unique
Managing Change	0.30	1.00					0.01	0.09	0.00	0.31%
Planning & Organising	0.33	0.47	1.00				0.01	0.17	0.00	1.35%
Interpersonal Skills	0.29	0.62	0.51	1.00			0.00	0.00	0.97	0.00%
Results Orientation	0.33	0.69	0.71	0.66	1.00		0.00	0.04	0.06	0.06%
Leadership	0.34	0.70	0.62	0.81	0.74	1.00	0.01	0.15	0.00	0.50%
Mean	6.74	119.56	117.10	124.30	123.36	122.00			R^2	0.15
Std. Deviation	1.22	12.53	14.36	13.77	12.51	13.26			Adj R^2	0.15
									R	0.38

Table 8 presents the results from regression of CLQn FA factor scores on job performance ratings. FA factor scores were the standardised factor scores produced by SPSS as part of the factor analysis procedure. Table 8 displays the correlations between the variables, the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (Beta), the semi-partial correlations (Unique)

and R, R^2 and Adjusted R^2. R for regression was significantly different from zero, F (3, 5511) = 319.67, $p < 0.001$. Altogether, 15% of the variability in job performance ratings was predicted by knowing the scores on the CLQn FA factors.

Table 8. Regression of CLQn FA factor scores on job performance ratings (n=5,515)

	Combined Assessment	People	Strategy	Business	B	Beta	Significance	Unique
People	0.26	1.00			0.13	0.10	0.00	0.83%
Strategy	0.29	0.39	1.00		0.23	0.19	0.00	2.99%
Business	0.31	0.40	0.29	1.00	0.26	0.21	0.00	3.69%
Mean*	6.74	0.02	0.02	0.02			R^2	0.15
Std. Deviation*	1.22	1.00	0.99	1.00			Adj R^2	0.15
							R	0.39

*FA factor scores are standardised

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