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Advanced Behaviour Measurement

CCSI[A]

Contact Centre
Scenario Inventory

CCSI-Alpha Technical Manual

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Contents

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1. Introduction

The CCSI is one of a range of situational tests from Reveal Advanced Behaviour Measurement. Our aim is to provide leading and innovative employment tests that are grounded in the latest research.

The CCSI offers an effective instrumentation set for selecting and/or developing people who work in contact centres. It applies a format known as the situational judgement test (see Weekley & Ployhart, 2006) in which participants are shown a passage of writing that describes a scenario. These scenarios portray challenging situations that people might encounter while working in contact centres. A scoring key, based on criterion keying and content validation, is used to assist in predicting the performance level of a given participant.

In employee selection, it is envisaged that the CCSI could be used as a relatively cost-effective initial screening device or as part of a range of selection devices. In employee development it is envisaged that the CCSI could be used to help convey expected standards for performance in situational and behavioural terms. The advantage here is that the CCSI does not make internal attributions and is therefore more likely to lead to behavioural change and is less likely to be perceived in a threatening manner.

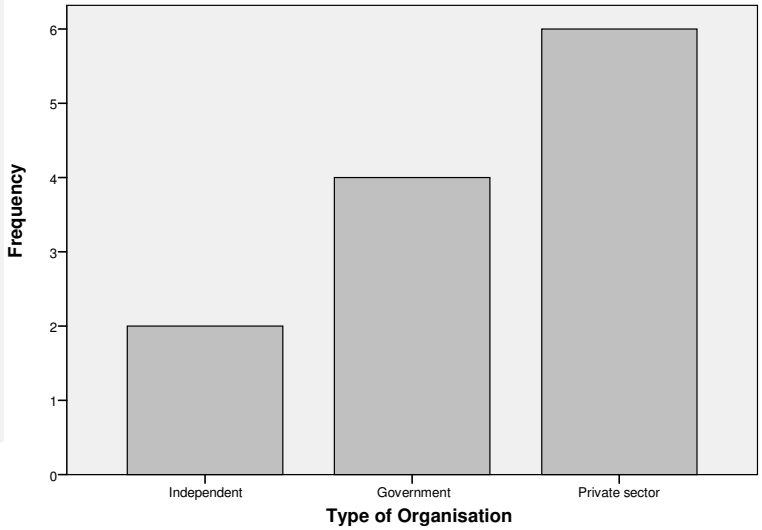
We hope that you will find the first version of this inventory promising in terms of the psychometric characteristics that have been observed and the thorough ground work that has gone into its development. It has long been known that selection in contact centres presents many challenges to managers in such a dynamic environment with typically high staff turnover rates. The CCSI presents a convenient approach to alleviating some of these issues by providing an instrument that is specifically designed with contact centres in mind.

A number of organisations from a vast range of sectors have assisted in the development of the CCSI. We wish to convey our thanks to those organisations who generously gave up their time to assist in the development of this inventory.

2. Developmental Sample

Job analytic techniques were used in the original development of the CCSI and involved the participation of subject matter experts (SMEs) from a range of organisations. Specifically, critical incidents and subject matter expert interviews were the approaches taken for this purpose (see Whetzel & Wheaton, 1997). Figure 1[a] shows the sources of job analytic information by organisation type. Note that some respondents had experience in multiple arenas. 'Independent' refers to contact centre consultants. A total of 12 SMEs were used in the development of the CCSI. As several authors recommend a minimum of three SMEs for this purpose (Aamodt, 1999; Green & Stutzman, 1986), 12 were considered to exceed these requirements. The median number of years experience in the developmental sample was 8 (interquartile range = 6). This was in excess of the minimum six months experience for SMEs recommended by Williams and Crafts (1997). Table 1 shows the SME response frequencies by position. A range of positions were included to allow for multiple perspectives to influence the overall content of the inventory. Table 2 shows SME response frequencies by experience. Taken together, Figure 1, and Tables 2 and 3 suggest that the developmental sample covered a broad range of contact centre organisations involved in varying purposes. Moreover, a range of position and experience perspectives were utilized in the construction of the CCSI.

Figure 1. Type of Organisation



[a] Descriptive, correlational, and factor analyses were conducted using SPSS (version 15.0). Generalizability and Decision Studies were conducted using EduG (version 3.07). Statistical power estimates were computed with G*Power (version 3.0.10).

Table 1. Job Analysis Sample Position Frequencies

		Responses	
		N	Percent
Positions	Team manager	8	34.8%
	Incumbent	10	43.5%
	General manager	3	13.0%
	Trainer	2	8.7%
Total		23	100.0%

Table 2. Job Analysis Sample Experience Frequencies

		Responses	
		N	Percent
Experience	Customer service	10	31.3%
	Sales	4	12.5%
	Campaign management	2	6.3%
	Outbound	3	9.4%
	Collections	3	9.4%
	Technology	1	3.1%
	Strategy	1	3.1%
	Telecommunications	2	6.3%
	Banking	2	6.3%
	Insurance	4	12.5%
Total		32	100.0%

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3. Reliability and Dependability

Summary: CCSI reliability was estimated as lying between .71 and .98

The original prototype of the CCSI contained 10 scenarios. This number was reduced to six because of organizational feedback to the effect that the inventory needed to be truncated out of practical considerations. The CCSI was abridged based on empirical findings and a desire to retain job content coverage as identified in the job analytic phase of development (cf. content validity). In terms of empirical findings, scenarios were retained when they correlated to a greater relative extent with external performance criteria. More information on this can be found in the section headed 'Validity'.

Generalizability theory (G theory) (Brennan, 2001) was selected as the appropriate choice for assessing the reliability (referred to as *dependability* in G theory) of the six-scenario CCSI. This is because situational judgement tests tend, unlike many other measures, to be multi-faceted in that they often present what are referred to as *nested models*. The design of the CCSI represents one such model whereby there are six scenarios (S), each of which contains its own set of items (I). The objects of measurement, in this case, are people (P) who respond to sets of items that are nested within situations, such that P(I:S).

EduG (version 3.07) was used to generate variance components for the generalisability study (G study) and the ensuing decision study (D study) in this analysis. Appendix A displays relevant parts of the read-out from the Edu G program for a study involving 84 participants. The sample was split between 54 participants from a private banking organisation and 28 participants from a public sector organisation. Demographic information on the sample is presented in Tables 3 through 6 below. A reasonable spread was observed across positions, genders, educational backgrounds, and ethnicities. The mean age for the sample was 32.41 (SD = 10.24).

Table 3. Total Sample Position Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private-sector employee	44	52.4	53.0	53.0
	Team leader	4	4.8	4.8	57.8
	Private-sector inductee	7	8.3	8.4	66.3
	Public-sector employee	28	33.3	33.7	100.0
	Total	83	98.8	100.0	
Missing		1	1.2		
Total		84	100.0		

Table 4. Total Sample Gender Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	35	41.7	44.3	44.3
	Female	44	52.4	55.7	100.0
	Total	79	94.0	100.0	
Missing		5	6.0		
Total		84	100.0		

Table 5. Total Sample Education Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.2	1.3	1.3
	Some high school	2	2.4	2.6	3.8
	High school (completed)	17	20.2	21.8	25.6
	Professional qualification	7	8.3	9.0	34.6
	Trade qualification	7	8.3	9.0	43.6
	Diploma	15	17.9	19.2	62.8
	Bachelor's degree	24	28.6	30.8	93.6
	Honour's degree	3	3.6	3.8	97.4
	Masters or PhD	2	2.4	2.6	100.0
	Total	78	92.9	100.0	
Missing		6	7.1		
Total		84	100.0		

Table 6. Total Sample Ethnicity Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	3	3.6	3.8	3.8
	Other European	3	3.6	3.8	7.7
	South African	3	3.6	3.8	11.5
	Indian	28	33.3	35.9	47.4
	Other Asian	2	2.4	2.6	50.0
	NZ European	31	36.9	39.7	89.7
	Polynesian	6	7.1	7.7	97.4
	Maori	2	2.4	2.6	100.0
	Total	78	92.9	100.0	
Missing		6	7.1		
Total		84	100.0		

The dependability of the responses to the CCSI was computed using a range of perspectives. The total six-scenario measure was assessed using a fixed scenario, infinite universe item-nesting approach (for further information on G studies, see Brennan, 2001; Shavelson & Webb, 1991), as it was reasoned that the scenarios covered the necessary universe needed for assessment in contact centres. This yielded a generalizability coefficient (G coefficient) for relative decisions of **.80** and a G coefficient of **.71** for absolute decisions. These coefficients are within the bounds of acceptability according to Shavelson and Webb (1991). An additional coefficient was computed for the scoring key (identified later in this report). The coefficient $\Phi(\lambda)$ uses a cut-off score in its estimation (see Brennan, 2001). In this case, the averaged scoring key (see Appendix B) ranged from 1 to 6, with higher scores indicating better performance. As it was envisaged that the CCSI would be used in selection scenarios, a stringent cut-off score of 5 was specified. This also returned a dependability estimate well within the bounds of acceptability ($\Phi(\lambda)$ = **.98**).

G theory also allows for the researcher to engage in what is essentially a 'what if' analysis of the various features of a measurement design. In the literature, these are often referred to as D studies (Shavelson & Webb, 1991). In Appendix A, this is labelled 'Optimization'. The D study suggested that if the universe of situations and items were both considered infinite, the CCSI would be more useful for relative (e.g., norm referenced) than absolute (e.g., cut-off) decisions. Also, adding a greater number of situations to the inventory would likely increase dependability. However, this would probably be at the unnecessary cost of practicality in that the inventory would take longer to complete.

4. Validity

Summary: CCSI concurrent validity was estimated as lying between .38 and .54

The concurrent validity of the CCSI was assessed using multiple external criteria obtained from a sub-sample of the larger group used in the above G study. This sub-sample consisted of sample consisted of 56 individuals whose demographic profiles are shown in Tables 7 through 10.

Table 7. Validity Sub-Sample Position Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee	44	78.6	80.0	80.0
	Team leader	4	7.1	7.3	87.3
	Inductee	7	12.5	12.7	100.0
	Total	55	98.2	100.0	
Missing		1	1.8		
Total		56	100.0		

Table 8. Validity Sub-Sample Gender Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	24	42.9	46.2	46.2
	Female	28	50.0	53.8	100.0
	Total	52	92.9	100.0	
Missing		4	7.1		
Total		56	100.0		

Table 9. Validity Sub-Sample Education Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.8	2.0	2.0
	Some high school	2	3.6	3.9	5.9
	High school (completed)	7	12.5	13.7	19.6
	Professional qualification	4	7.1	7.8	27.5
	Trade qualification	3	5.4	5.9	33.3
	Diploma	10	17.9	19.6	52.9
	Bachelor's degree	19	33.9	37.3	90.2
	Honour's degree	3	5.4	5.9	96.1
	Masters or PhD	2	3.6	3.9	100.0
	Total	51	91.1	100.0	
Missing		5	8.9		
Total		56	100.0		

Table 10. Validity Sub-Sample Ethnicity Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.8	2.0	2.0
	South African	2	3.6	3.9	5.9
	Indian	27	48.2	52.9	58.8
	Other Asian	1	1.8	2.0	60.8
	NZ European	15	26.8	29.4	90.2
	Polynesian	4	7.1	7.8	98.0
	Maori	1	1.8	2.0	100.0
	Total	51	91.1	100.0	
Missing		5	8.9		
Total		56	100.0		

The number of participants who could be matched up to criteria dropped to 34 in this sample as records were not available for some employees whilst others were inductees who had no performance data. As such, non-parametric correlations in the form of Spearman's Rho were used to assess all relationships. Note, however, that a power analysis indicated that for minimum acceptable power (β = .80), a minimum sample size of 64 was necessary to detect correlations of around .3. As such, this analysis may be overly insensitive to detecting statistically significant results.

Bearing this caution in mind, five external criteria were available for analysis. These included sales targets (sales), contribution to financial plans (finaps%), a quality score rated by immediate managers (quality benchmark 76%), and, rated in the same manner, a customer satisfaction rating which was intended to exceed 80% (cust sat benchmark 80%). Delivery of customer service (calls over 76%) was also included. A scoring key was developed, identifying a subset of 12

item responses that a) correlated with the greatest number of organisational outcomes, b) correlated to the greatest relative magnitude with organisation outcomes and c) allowed coverage of a reasonable set of situations described by the SME panel. As such, this approach was guided by criterion keying and SME judgement (Bergman, Drasgow, Donovan, & Henning, 2006 provide a summary of the various approaches to scoring situational judgement tests). Appendix B shows the results of the correlation analysis, uncorrected for attenuation due to measurement error or criterion unreliability to provide a conservative approach to validation. Statistically significant correlations were found with sales (r = .38, p < .05) and particularly quality service (r = .54, p < .01). Bearing in mind the lack of statistical power in this study, repeats on larger samples from a range of organisations would be beneficial.

In terms of structural validity, a principal axis factor analysis was run on items aggregated within situations (labelled 'average scenario' 1 through 6 in Appendix C). This strategy was taken to allow for acceptable ratios of subjects-to-variables. Direct oblimin rotation was used to allow for factor intercorrelations and a scree criterion was used for factor extraction. The choice of oblique rotation appeared reasonable given the factor correlation of .39 shown in Appendix C. Moreover, the scree criterion also appears defensible, given the gradual flattening out of explained variance shown in the scree plot after the extraction of Factor 2 (see Hair, Anderson, Tatham, & Black, 1998 for more information on extraction criteria), again, in Appendix C. Schmitt and Chan (2006) report that research commonly identifies an overall or general performance factor in situational judgement tests. The current study was no exception to this, in that an overall performance factor tended to dominate. The last scenario formed its own factor, which correlated with the first (as mentioned above). In sum, it appears reasonable to consider the CCSI as a general measure of responses to contact centre situations. This idea sits in line with a host of research suggesting similar patterns, as summarised by Schmitt and Chan.

5. References

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6. Appendix

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Contact Centre
Scenario Inventory

Appendix A: EduG (version 3.07) G and D Studies

CCSI six-situation version

Observation and Estimation Designs

Fac.	Lev.	Univ.	Comments	Reduction
P	84	INF	Persons	
S	6	6	Situations	
I:S	8	INF	Items in Situations	

Analysis of variance

Sources of var.	S.S.	D.F.	M.S.	Random Model	Mixed Comp.	Corrected Comp.	%	Std Error
P	840.99082	83	10.13242	0.16502	0.17007	0.17007	4.9	0.03254
S	118.06969	5	23.61394	-0.12814	-0.12814	-0.10678	0.0	0.03949
I:S	4598.13244	42	109.47934	1.27988	1.27988	1.27988	37.2	0.27787
PS	917.65947	415	2.21123	0.03025	0.03025	0.02521	0.7	0.02003
PI:S	6864.74256	3486	1.96923	1.96923	1.96923	1.96923	57.2	0.04715
Totals	13339.59499	4031						

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Generalizability Study
Measurement design: P/IS

Sources of var.	Differ. Variance	Sources of var.	Relative err. var.	Absolute err. var.	%
P	0.17007		...	...	...
	...	S	...	(0.00000)	0.0
	...	I:S	...	0.02666	39.4
	...	PS	(0.00000)	(0.00000)	0.0
	...	PI:S	0.04103	0.04103	60.6
Sum of var.	0.17007		0.04103	0.06769	
Standard dev.	0.41239		0.20255	0.26017	

Generalizability coefficients
Coef_G relative: 0.80565
Coef_G absolute: 0.71530

Optimization

		Lev.	Univ.	Opt 1 Lev.	Univ.	Opt 2 Lev.	Univ.	Opt 3 Lev.	Univ.
P		84	INF	84	INF	84	INF	84	INF
S		6	6	6	INF	10	10	10	INF
I:S		8	INF	8	INF	8	INF	8	INF
Observations		4032		4032		6720		6720	
Coef_G rel.		0.80565		0.78177		0.87224		0.85654	
Coef_G abs.		0.71530		0.69409		0.80536		0.79087	
Rel. Err. Var.		0.04103		0.04607		0.02462		0.02764	
Rel. Std. Err.		0.20255		0.21463		0.15689		0.16625	
Abs. Err. Var.		0.06769		0.07273		0.04061		0.04364	
Abs. Std. Err.		0.26017		0.26969		0.20153		0.20890	

Lambda for Scoring Key Only:

Grand mean for levels used: 3.33755
Error variance of the mean for levels used: 0.02918
Standard error of the grand mean: 0.17081

Estimate of Phi(lambda)
Cut Score = lambda = 5
Phi(lambda) = 0.97723

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Appendix B: Non-Parametric Correlations (Spearman's Rho)

		CCSI score	sales %	finaps %	quality benchmark 76%	cust sat benchmark 80%	calls over 76%
CCSI score	Correlation Coefficient						
	Sig. (2-tailed)						
	N	45					
sales %	Correlation Coefficient	.382(*)					
	Sig. (2-tailed)	.026					
	N	34	37				
finaps %	Correlation Coefficient	.204	.277				
	Sig. (2-tailed)	.246	.097				
	N	34	37	37			
quality benchmark 76%	Correlation Coefficient	.543(**)	.499(**)	.230			
	Sig. (2-tailed)	.001	.002	.171			
	N	34	37	37	37		
cust sat benchmark 80%	Correlation Coefficient	.321	.331(*)	.110	.134		
	Sig. (2-tailed)	.064	.045	.519	.429		
	N	34	37	37	37	37	
calls over 76%	Correlation Coefficient	.329	-.004	.041	.109	.291	
	Sig. (2-tailed)	.058	.981	.807	.521	.080	
	N	34	37	37	37	37	37

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix C: Factor Analysis

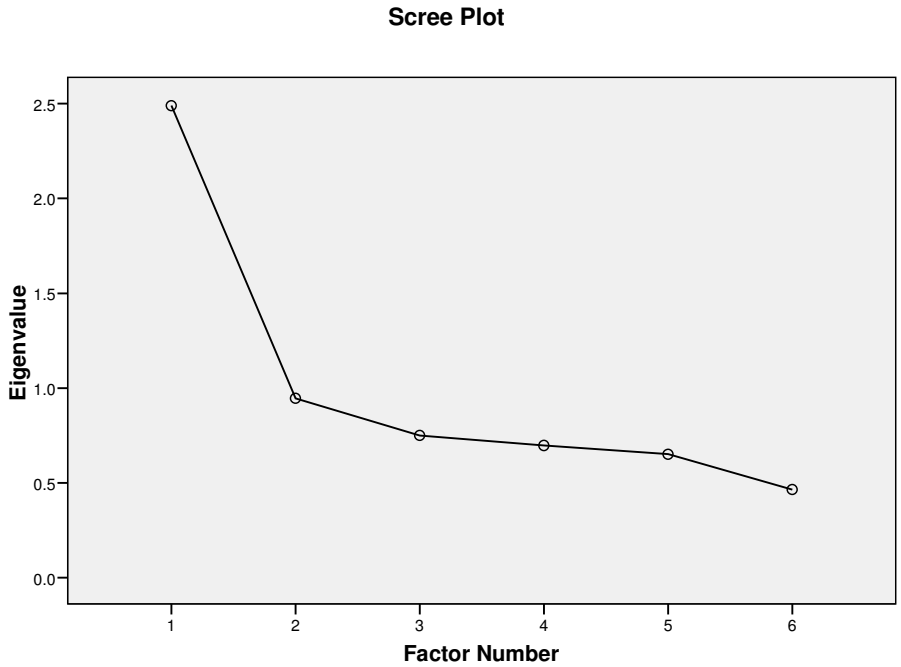
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	65.209
	df	15
	Sig.	.000

Communalities

	Initial	Extraction
average scenario 1	.270	.364
average scenario 2	.212	.302
average scenario 3	.343	.466
average scenario 4	.271	.374
average scenario 5	.220	.287
average scenario 6	.090	.409

Extraction Method: Principal Axis Factoring.



Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings(a)
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.490	41.497	41.497	1.859	30.991	30.991	1.830
2	.946	15.769	57.265	.342	5.693	36.684	.742
3	.750	12.506	69.771				
4	.697	11.623	81.394				
5	.652	10.863	92.257				
6	.465	7.743	100.000				

Extraction Method: Principal Axis Factoring.
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern Matrix

	Factor	
	1	2
average scenario 1	.611	
average scenario 2	.560	
average scenario 3	.608	
average scenario 4	.638	
average scenario 5	.506	
average scenario 6		.634

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
Rotation converged in 3 iterations.

Factor Correlation Matrix

Factor	1	2
1	1.000	.389
2	.389	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.