SAMPLE ATTRIBUTE

Agreement between Assessors (AbA) Binary Attribute Study

Facility/Location:	Albuquerque
KPI / O:	
Key characteristic:	PCRT Result
Inspection method:	PCRT Result
Date of study:	1-Jul-22
Study manager:	

Comparison of performance

A1=A2	48	out of	50	or	96.0%	Within assessor consistency
B1=B2	49	"	50	"	98.0%	
A=B	47	"	50	"	94.0%	Between assessor agreement
A=E	48	"	50	"	96.0%	Agreement with expert
B=E	49	"	50	"	98.0%	

0 = "Bad", 1 = "Good"

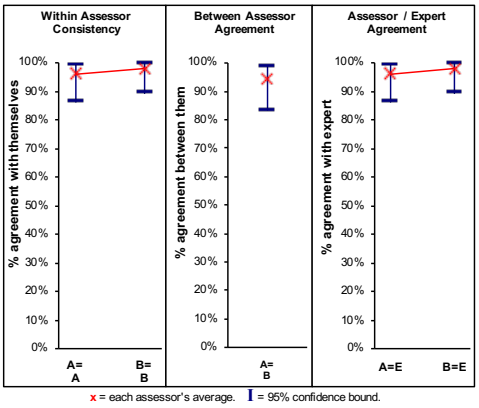
Part	A1 Assessor A Obs. 1	A2 Assessor A Obs. 2	E Expert (Opt.)	B1 Assessor B Obs. 1	B2 Assessor B Obs. 2
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	1	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
32	0	0	0	0	0
33	0	0	0	0	0
34	0	0	0	1	0
35	0	0	0	0	0
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
40	0	0	0	0	0
41	1	1	1	1	1
42	1	1	1	1	1
43	1	1	1	1	1
44	1	1	1	1	1
45	1	1	1	1	1
46	1	1	1	1	1
47	1	1	1	1	1
48	1	0	1	1	1
49	1	1	1	1	1
50	1	1	1	1	1

Assessor

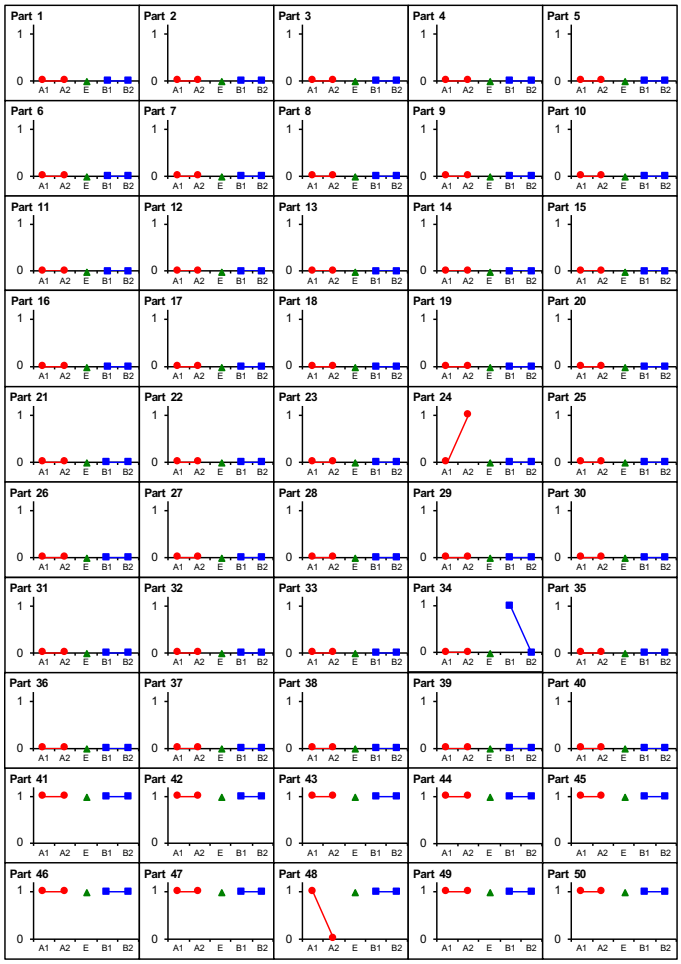
A
B
E (opt.)

Conclusions:

A's consistency is OK (> 95%.)
B's consistency is OK (> 95%).
A's and B's consistency about equal.
A to B agreement is poor (< 95%).
A to E agreement is OK (> 95%.)
B to E agreement is OK (> 95%.)
A to E & B to E agreement about equal.



x = each assessor's average. I = 95% confidence bound.



SAMPLE GRR
GAGE REPEATABILITY & REPRODUCIBILITY STUDY

GAGE NUMBER	1	PART NUMBER	N/A
GAGE NAME	Sample Automotive Part	PART NAME	Aluminum Casting
APPRAISERS	2	TRIALS 2	PARTS 10
APPRAISER A	Operator X	APPRAISER B Operator Y	APPRAISER C N/A

Appraiser/Trial #	PARTS 1	2	3	4	5	6	7	8	9	10	
A	9.653	9.638	9.647	9.643	9.662	9.657	9.656	9.656	9.658	9.657	
	9.653	9.638	9.648	9.643	9.661	9.658	9.654	9.656	9.658	9.657	
	3										
AVG's	9.653	9.638	9.648	9.643	9.662	9.658	9.655	9.656	9.658	9.657	$\bar{X}a$ 9.653
Range	0.000	0.000	0.001	0.000	0.001	0.001	0.002	0.000	0.000	0.000	$\bar{R}a$ 0.001
B	9.653	9.637	9.647	9.644	9.661	9.658	9.654	9.653	9.66	9.656	
	9.653	9.637	9.647	9.644	9.661	9.657	9.655	9.654	9.66	9.657	
	3										
AVG's	9.653	9.637	9.647	9.644	9.661	9.658	9.655	9.654	9.660	9.657	$\bar{X}b$ 9.652
Range	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	$\bar{R}b$ 0.000
AVG's											$\bar{X}c$
Range											$\bar{R}c$
Part Average	9.653	9.638	9.647	9.644	9.661	9.658	9.655	9.655	9.659	9.657	$\bar{\bar{X}}$ 9.653
											R_P 0.024

RANGE VARIATION

$\bar{R}a$	0.001
$\bar{R}b$	0.000
$\bar{R}c$	
$\bar{\bar{R}}$	0.0004

No. Trials	D_4
2	3.267
3	2.575
No. Trials	A_2
2	1.880
3	1.023

$\bar{R}$ x (D_4)	=	UCL_R
0.0004 x 3.267	=	0.0015
Note: LCLR is zero with < 7 trials		
$\bar{\bar{X}}$ + ($\bar{R}$ x A_2)	=	UCL_X
9.653+(0.0004 x 1.88)	=	9.653
$\bar{\bar{X}}$ - ($\bar{R}$ x A_2)	=	LCL_X
9.653-(0.0004 x 1.88)	=	9.652

Max $\bar{X}$	9.653
Min $\bar{X}$	9.652
$\bar{X}$ Diff.	0.0003

Note:

DATE 6/15/22

STUDY PERFORMED BY Vibrant Application Engineer

MEASUREMENT UNIT ANALYSIS	% TOTAL VARIATION (TV)
REPEATABILITY - EQUIPMENT VARIATION (EV) EV = $\bar{R}$ x K_1 EV = 0.0004 x 0.8862 EV = 0.0004 Trials: 2 — K_1: 0.8862	% EV = 100 (EV/TV) % EV = 5.33%
REPRODUCEABILITY - APPRAISER VARIATION (AV) AV = $\{(x_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$ n=Parts r=Trials AV = {(0.0003 x 0.7071)^2 - (0.0004 ^2/(10 x 2))}^1/2 AV = 0.0002 Appraisers: 2 — K_2: 0.7071	% AV= 100(AV/TV) % AV= 2.04%
REPEATABILITY & REPRODUCABILITY (R&R) R&R = $\{(EV^2 + AV^2)\}^{1/2}$ R&R = {(0.0004^2 + 0.0002^2)}^1/2 R&R = 0.0004	% R&R= 100(R&R/TV) % R&R= 5.71% Note: Guidelines for Acceptance of System Based on %GRR Under 10% = Measurement sysetm is acceptable. 10% - 30% = May be acceptable based on gage cost. Over 30% = Measurement system not acceptable.
PART VARIATION (PV) PV = $R_P \times K_3$ PV = 0.0237 x 0.3146 PV = 0.0075 Parts: 10 — K_3: 0.3146	% PV= 100(PV/TV) % PV= 99.84%
TOTAL VARIATION (TV) TV = $\{(GRR^2 + PV^2)\}^{1/2}$ TV = {(0.0004^2 + 0.0075^2)}^1/2 TV = 0.0075	**NUMBER OF DISTINCT CATEGORIES (ndc)** ndc= 1.41(PV/R&R) ndc= 24 Note: Guidelines for Acceptance: ndc greater than of equal to 5 = OK
For information on the theory and constants used in the form see MSA Reference Manual, Third edition	