Quali-Sense

SENSOMETRICS 2008

The Panel Checking Workshop

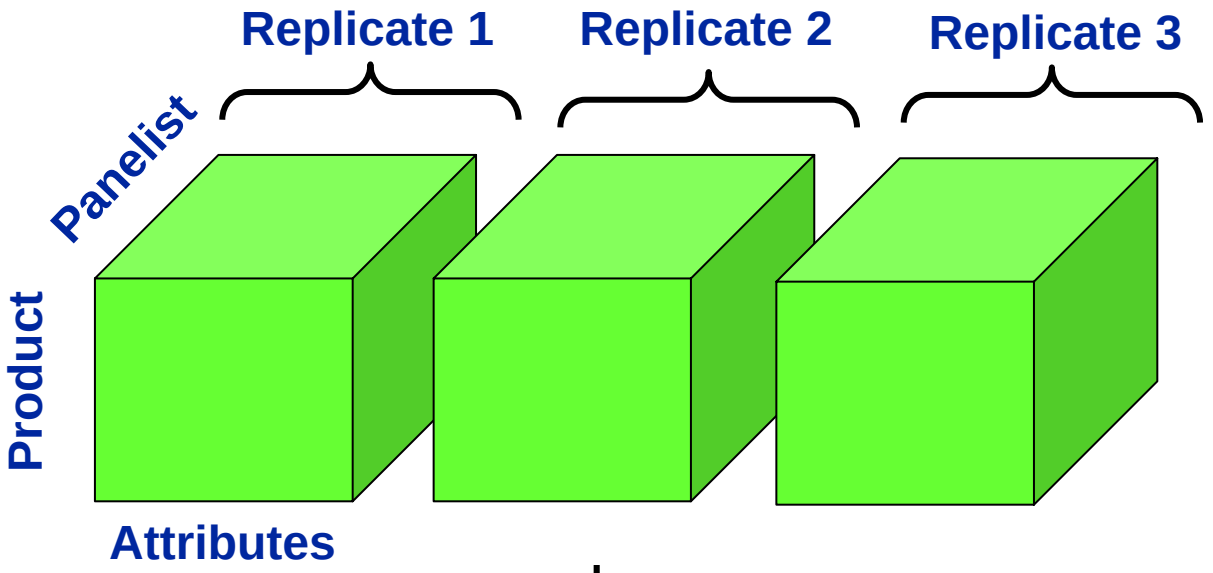
CAMO Software, by *Dongsheng Bu (US Office)*

Why Use the Quali-Sense?

- Quality check of data
- Prepare data for further analysis
  - Can we trust the panel?
  - Calculate a reliable panel average

- Evaluate the performance of each panelist
  - Give feedback on performance
  - Need for training
  - Remove unreliable panelists

Preparing Panel Data for Further Multivariate Analysis



Average

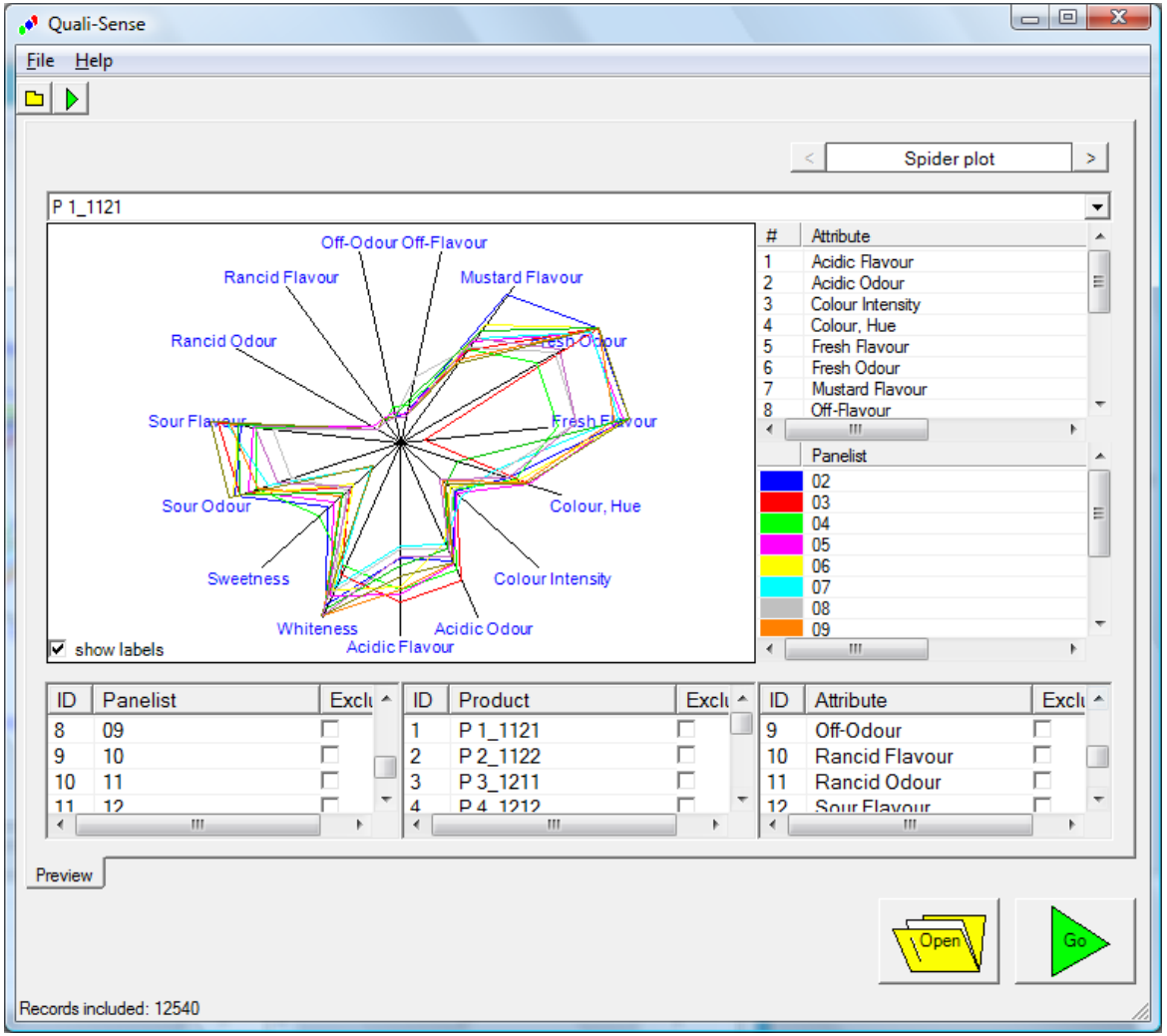
Remove unreliable panelists

Calculate a reliable panel average

How the Quali-Sense do the Analyses?

Five tests that cover most sensory aspects

- Assessor sensitivity
- Assessor reproducibility
- Assessor Agreement
- Assessor Crossover
- Eggshell Correlation

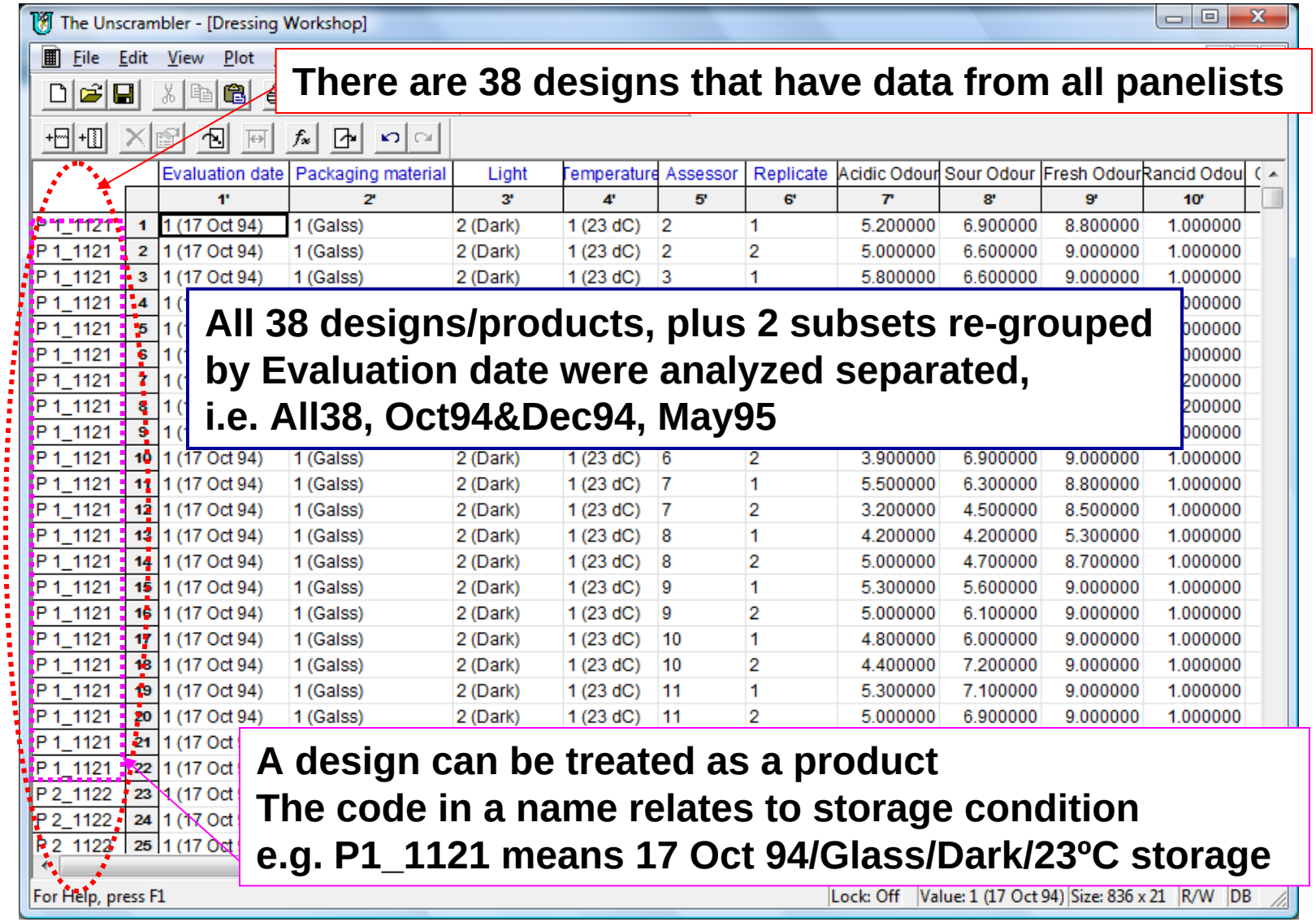


Workshop Dataset Overview

- To study the effect of storage on the sensory quality of a salad dressing
- There are several “holes” in the design that the dressing had gone bad
- Some of the assessors were not present on all sessions.

Packaging materials	The sensory attributes:
1: Glass (transparent)	1: Acidic Odour
2: PET (Polyethylene Terephthalate)	2: Sour Odour
3: PP (Polypropylene)	3: Fresh Odour
4: Greaseproof paper	4: Rancid Odour
5: Aluminium foil	5: Off-Odour
6: EVOH (Ethylene-Vinyl Alcohol Copolymer)	6: Whiteness
	7: Colour, Hue
Lighting conditions:	8: Colour Intensity
1: Daylight	9: Mustard flavour
2: Dark	10: Acidic flavour
	11: Sour flavour
Evaluation dates:	12: Sweetness
1, 17 Oct 1994	13: Fresh flavour
2, 19 Dec 1994	14: Rancid Flavour
3, 2 Mar 1995	15: Off-Flavour
4, 4 May 1995	**Temperatures:**
5, 21 Jun 1995	1: Room temperature (23 °C)
6, 24 Aug 1995	2. Recommended temperature (4 °C)

Dataset Rearrangement

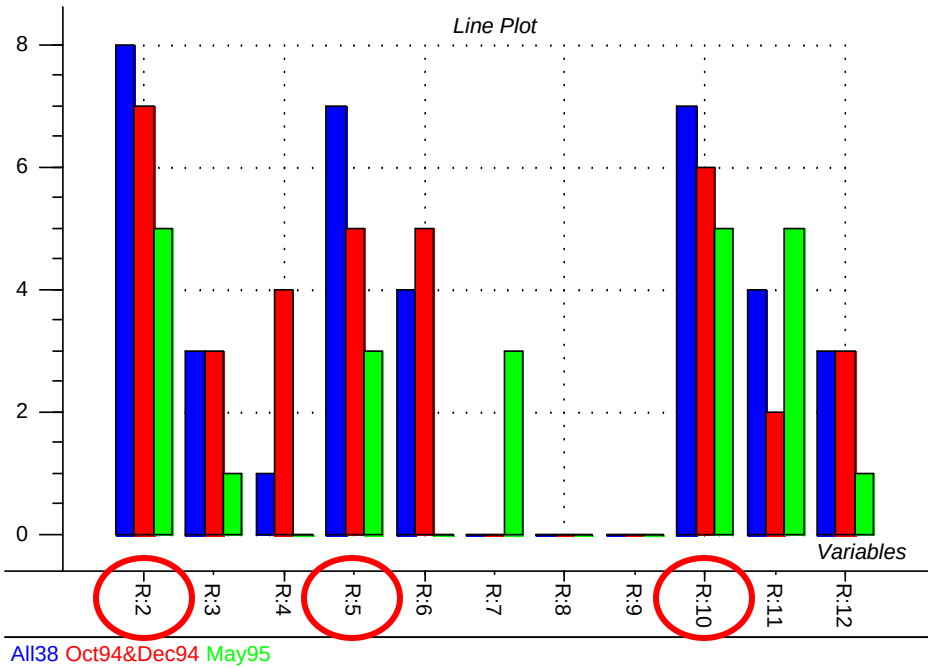


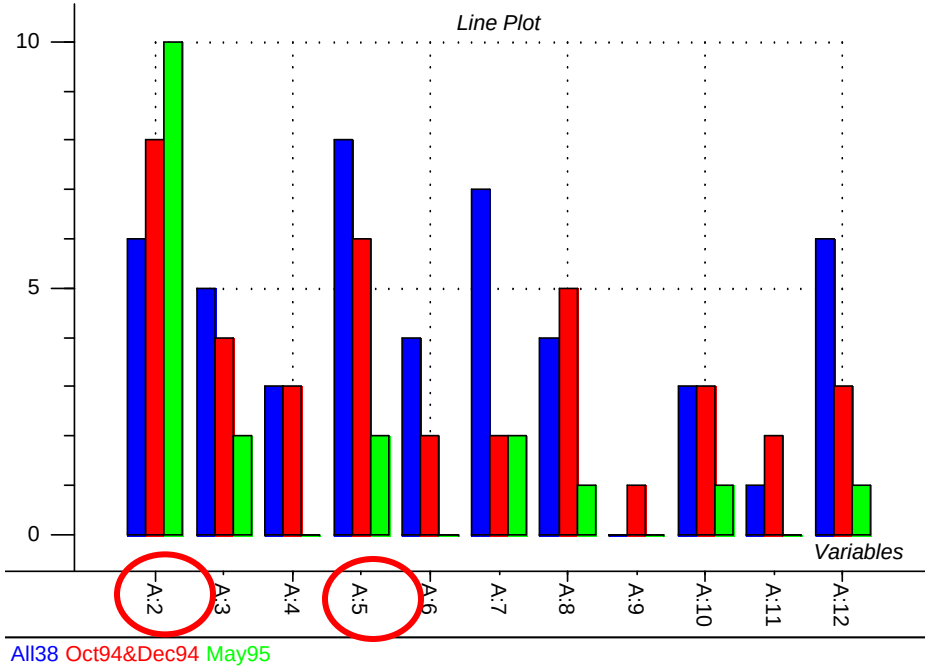
		Evaluation date	Packaging material	Light	Temperature	Assessor	Replicate	Acidic Odour	Sour Odour	Fresh Odour	Rancid Odou
		1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
P 1_1121	1	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	2	1	5.200000	6.900000	8.800000	1.000000
P 1_1121	2	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	2	2	5.000000	6.600000	9.000000	1.000000
P 1_1121	3	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	3	1	5.800000	6.600000	9.000000	1.000000
P 1_1121	4	1 (									000000
P 1_1121	5	1 (									000000
P 1_1121	6	1 (									000000
P 1_1121	7	1 (									200000
P 1_1121	8	1 (									200000
P 1_1121	9	1 (									000000
P 1_1121	10	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	6	2	3.900000	6.900000	9.000000	1.000000
P 1_1121	11	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	7	1	5.500000	6.300000	8.800000	1.000000
P 1_1121	12	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	7	2	3.200000	4.500000	8.500000	1.000000
P 1_1121	13	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	8	1	4.200000	4.200000	5.300000	1.000000
P 1_1121	14	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	8	2	5.000000	4.700000	8.700000	1.000000
P 1_1121	15	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	9	1	5.300000	5.600000	9.000000	1.000000
P 1_1121	16	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	9	2	5.000000	6.100000	9.000000	1.000000
P 1_1121	17	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	10	1	4.800000	6.000000	9.000000	1.000000
P 1_1121	18	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	10	2	4.400000	7.200000	9.000000	1.000000
P 1_1121	19	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	11	1	5.300000	7.100000	9.000000	1.000000
P 1_1121	20	1 (17 Oct 94)	1 (Galss)	2 (Dark)	1 (23 dC)	11	2	5.000000	6.900000	9.000000	1.000000
P 1_1121	21	1 (17 Oct									
P 1_1121	22	1 (17 Oct									
P 2_1122	23	1 (17 Oct									
P 2_1122	24	1 (17 Oct									
P 2_1122	25	1 (17 Oct									

Overview on Panelists

Reproducibility, Sensitivity and Agreement

Counts of poor performance





Reproducibility Test
Panelists 2, 5, and 10 have large counts in poor performance

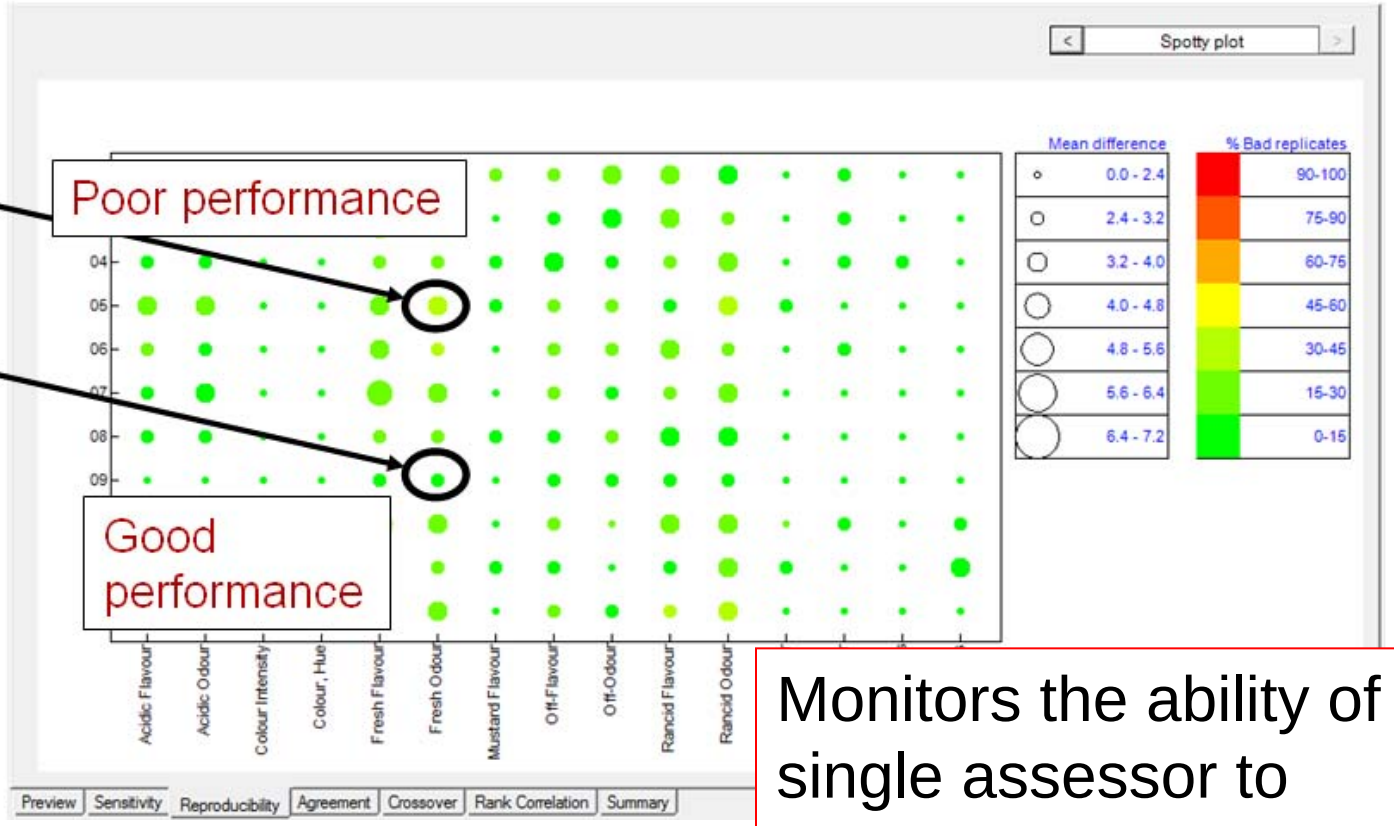
Agreement Test
Panelists 2 and 5 have large counts in poor performance

Sensitivity Test is OK for all panelists (results not shown)

Reproducibility

p-Value < 0.05 indicates poor performance and colored in red
Big and red dots in the Spotty plot indicate poor performance

	Fresh Odour
▶02	0.19
03	0.76
04	0.64
05	0.05
06	0.51
07	0.22
08	0.93
09	1
10	0.31
11	0.89
12	0.02

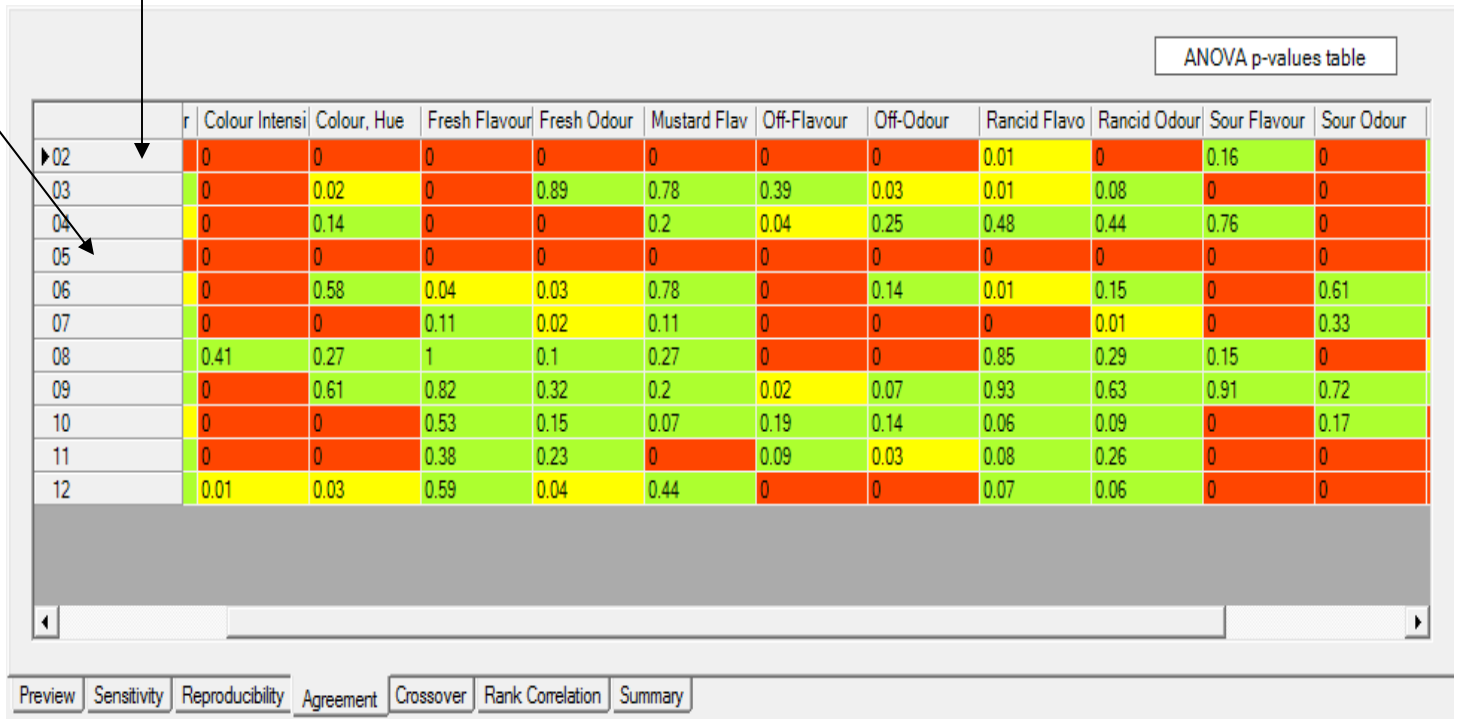


Monitors the ability of a single assessor to reproduce their result with respect to the rest of the panel.

Agreement

Having a panelist with poor performance in the panel will affect the results from the whole panel.

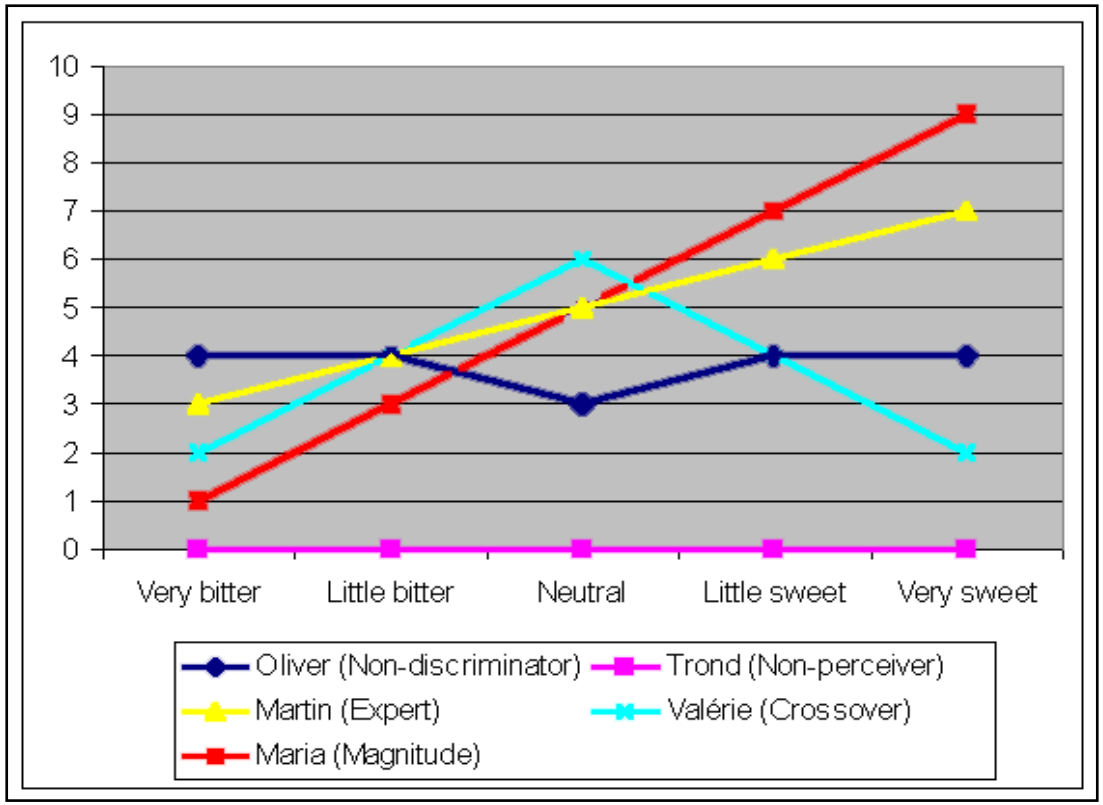
Outlying assessor



	r	Colour Intensi	Colour, Hue	Fresh Flavour	Fresh Odour	Mustard Flav	Off-Flavour	Off-Odour	Rancid Flavo	Rancid Odour	Sour Flavour	Sour Odour
02		0	0	0	0	0	0	0	0.01	0	0.16	0
03		0	0.02	0	0.89	0.78	0.39	0.03	0.01	0.08	0	0
04		0	0.14	0	0	0.2	0.04	0.25	0.48	0.44	0.76	0
05		0	0	0	0	0	0	0	0	0	0	0
06		0	0.58	0.04	0.03	0.78	0	0.14	0.01	0.15	0	0.61
07		0	0	0.11	0.02	0.11	0	0	0	0.01	0	0.33
08		0.41	0.27	1	0.1	0.27	0	0	0.85	0.29	0.15	0
09		0	0.61	0.82	0.32	0.2	0.02	0.07	0.93	0.63	0.91	0.72
10		0	0	0.53	0.15	0.07	0.19	0.14	0.06	0.09	0	0.17
11		0	0	0.38	0.23	0	0.09	0.03	0.08	0.26	0	0
12		0.01	0.03	0.59	0.04	0.44	0	0	0.07	0.06	0	0

Agreement

Monitors each assessors agreement with the rest of the panel. Agreement errors could be due to several reasons:



Magnitude

Expert

Non-discriminator

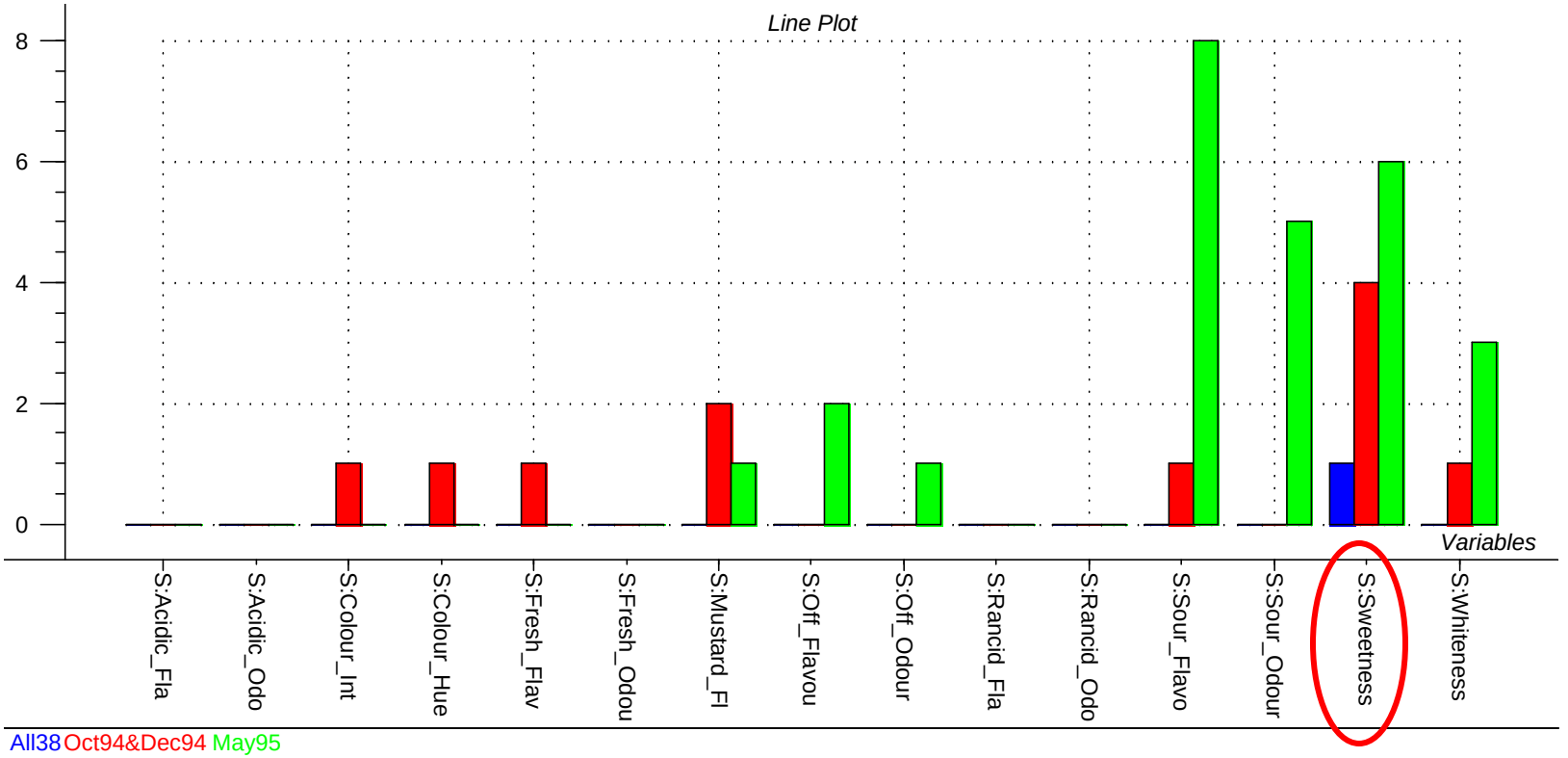
Cross-over

Non-perceiver

Overview on Sensory Attrributes

Reproducibility, Sensitivity and Agreement

Counts of poor performance

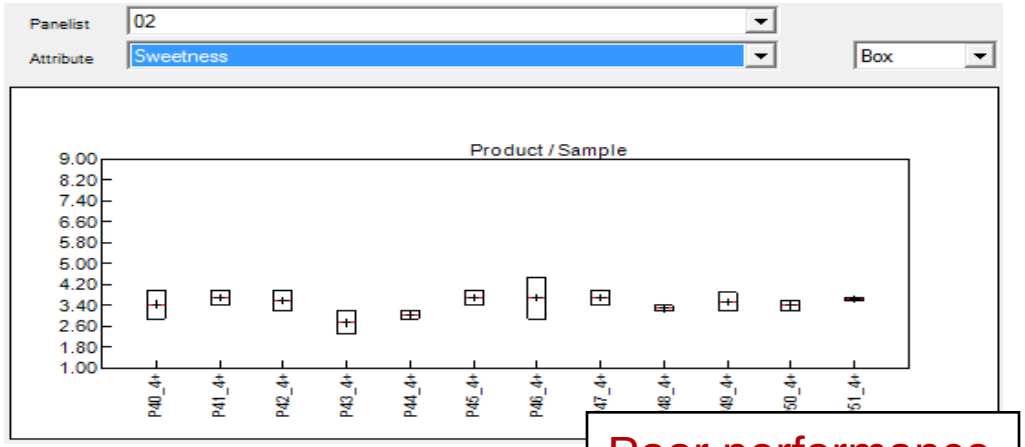


Sensitivity Test shows many panelists have problem with Sweetness

Reproducibility Test and Agreement Test are OK (results not shown)

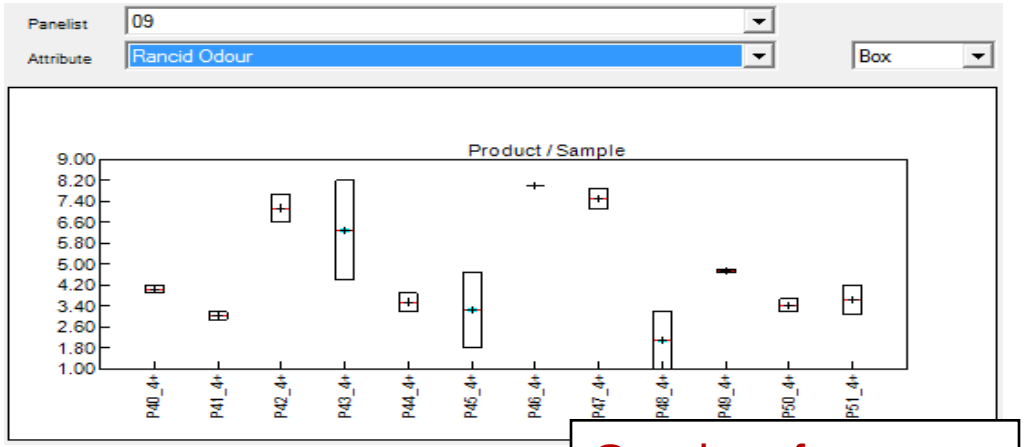
Sensitivity

- Measures the ability of a single assessor to identify product differences.
- A low *p*-value significant difference between products, and is thus good.



Poor performance

	Rancid Odour	Sweetness
▸02	0.01	0.79
03	0	0
04	0	0.05
05	0.02	0.48
06	0.01	0.24
07	0.01	0.3
08	0	0.05
09	0	0.14
10	0.02	0.34
11	0	0.01
12	0.02	0.36

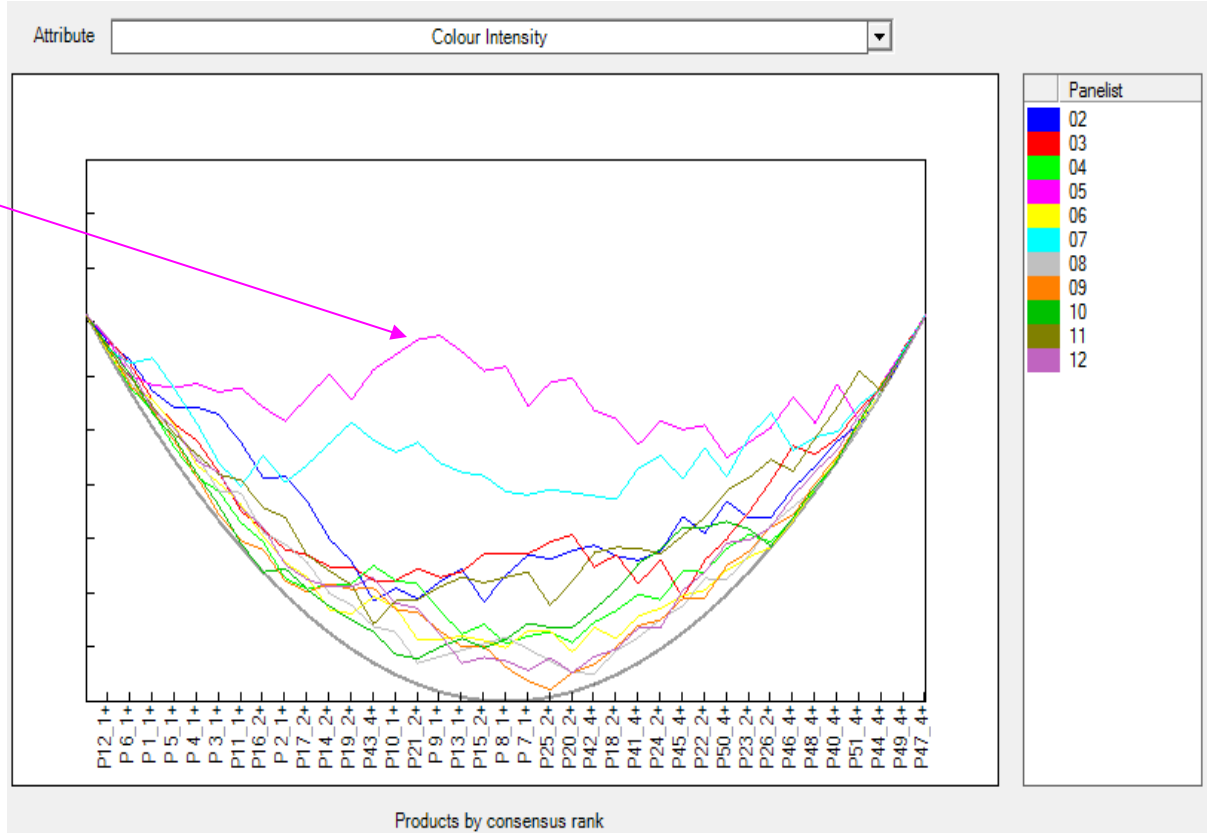


Good performance

Rank Correlation

”Eggshell” plot indicates the ranking of each product by the panelists.

Assessor 5 has ranked the products differently from the other panelists



Agreement and Crossover Errors

		Sour Flavour	Sour Odour	Sweetness
05	Crossover %	89.68	58.96	54.79
	Agreement p	0.00	0.00	0.00
06	Crossover %	31.05	53.80	27.78
	Agreement p	0.00	0.61	0.87
07	Crossover %	7.62	12.84	58.90
	Agreement p	0.00	0.33	0.00
08	Crossover %	59.89	92.38	52.60
	Agreement p	0.15	0.00	0.03
09	Crossover %	56.32	65.83	42.84
	Agreement p	0.91	0.72	0.61
10	Crossover %	56.85	67.68	70.94
	Agreement p	0.00	0.17	0.00
	Crossover %	2.02	7.03	47.45

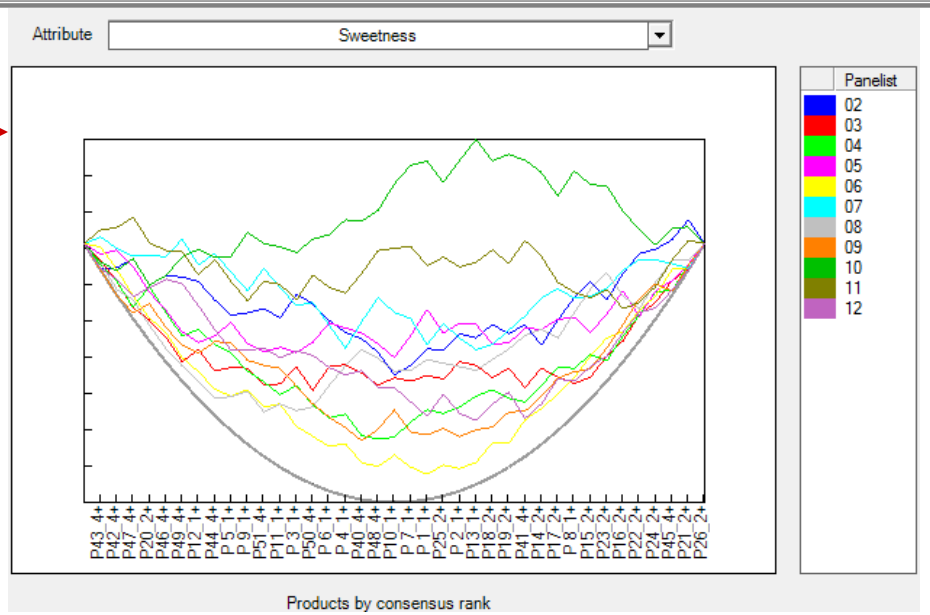
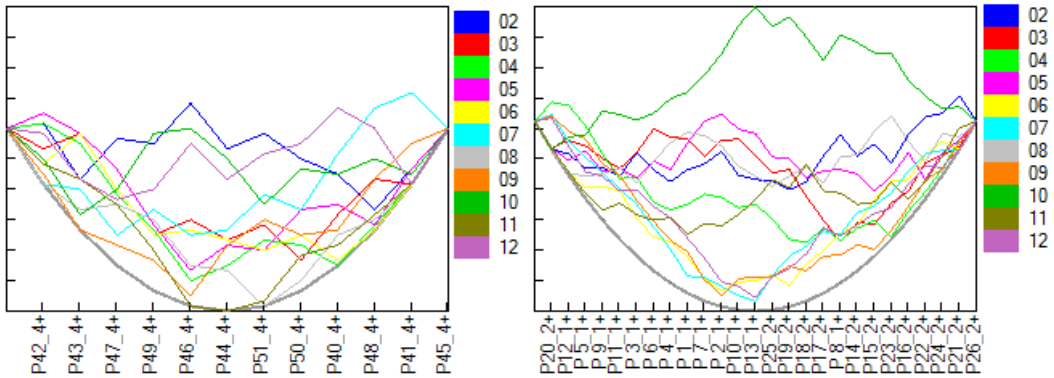


Table shows level of agreement, and also cross-over error, stemming from wrong use of scale.

Panelists rank product differently In Sweetness

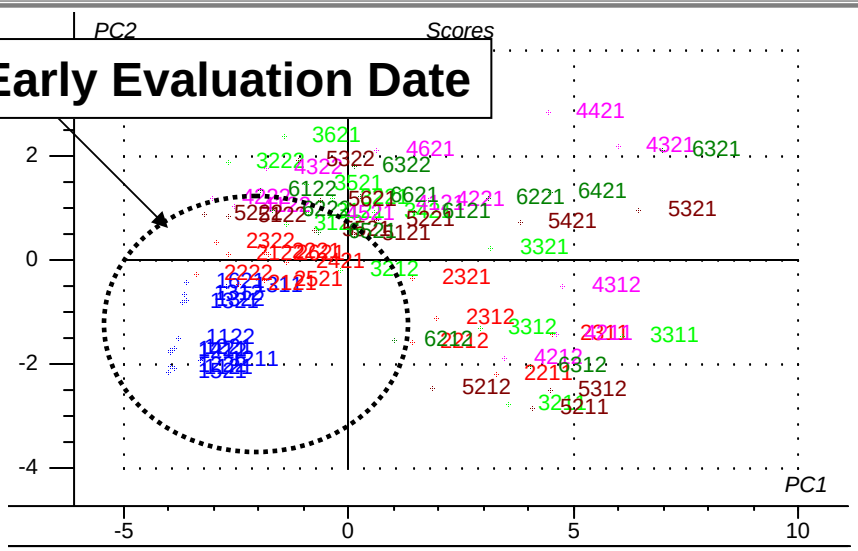
Subsets (Oct94&Dec94, May95) results

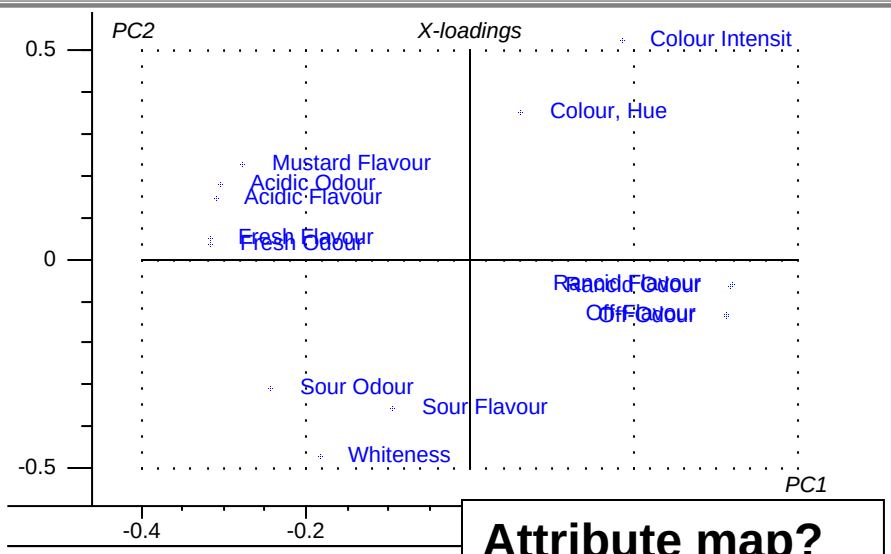


Summary from Quali-Sense

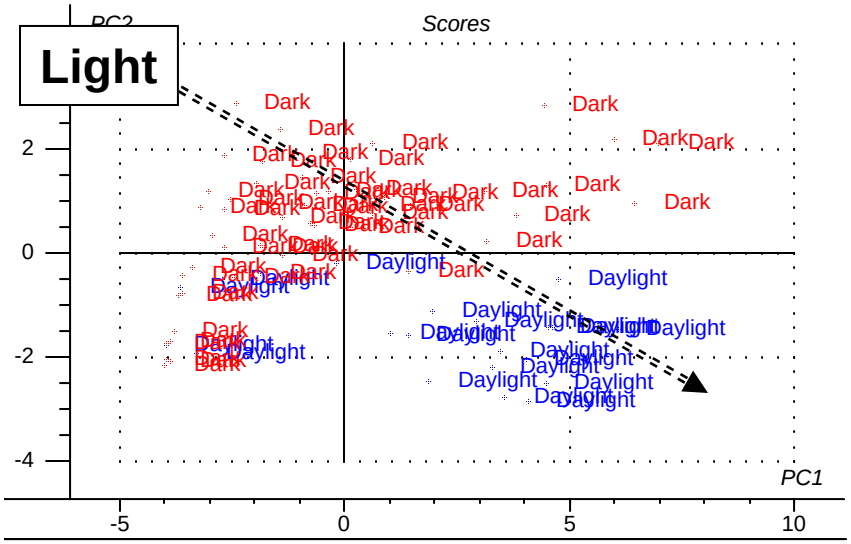
- Generally speaking, data quality is pretty good
- Panelists 2 and 5 have problem in reproducibility and agreement
- The panel need to improve the ability of Sweetness test, both in sensitivity and rank correlation

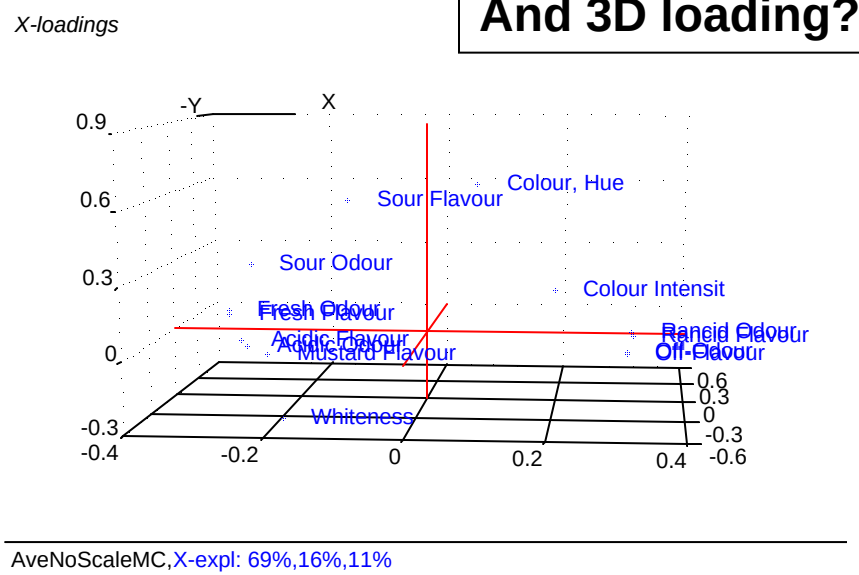
PCA (no P2 and P5) - Welcome Back to Multivariate World- The Unscrambler





Attribute map?
And 3D loading?





Conclusion

We suggest such workflow in Product Development

The Unscrambler

Plan

Quali-Sense

Sensory analysis

Monitor panel performance
Quality check
Prepare data for analysis

The Unscrambler

Data analysis

Acknowledgement

- CAMO Oslo Norway Office
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- CAMO Bangalore India Office
  - Suresh Kumar
- Sensometrics 2008 Committee

Play Demo
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Thank You!