Generating, refining and calibrating targets: comparing the performance of panelists on two white wine panels

J. C. Castura*[1], C. J. Findlay[1]
[1]Compusense Inc., Canada
jcastura@compusense.com

Does generating, refining, and calibrating a panel to its own training targets using Compusense *FCM™* characterize panelists' subsequent scale usage and product differentiation abilities?

materials + methods

Products
- 20 commercially available white wines

Sensory analysis + experimental design

» panel composition
- Panel T: 12 panelists trained in descriptive analysis of red wine
- Panel U: 11 panelists without prior experience in sensory analysis

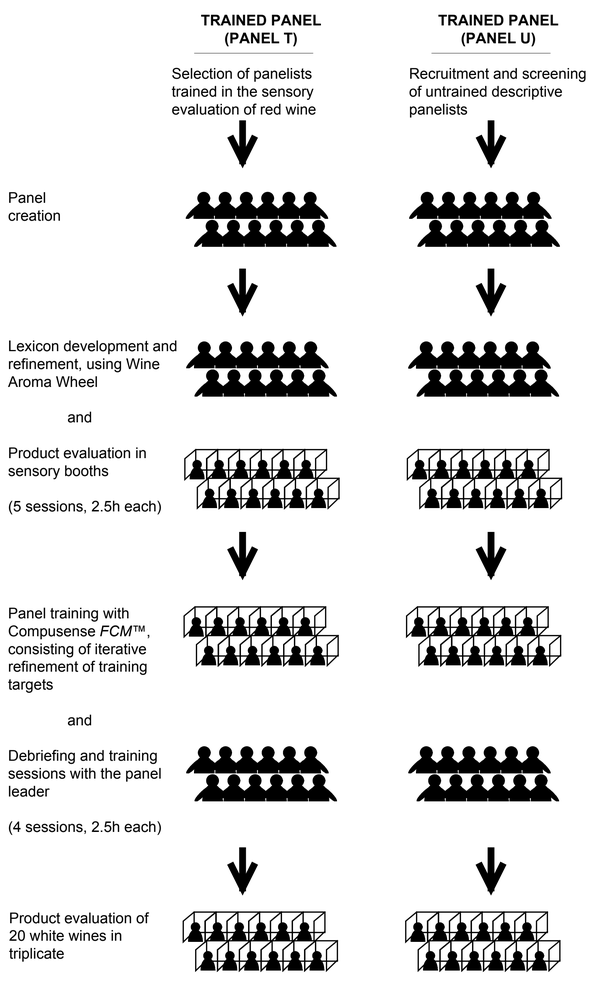
» during first five 2.5h training sessions
- each panel provided with Wine Aroma Wheel (Noble *et al.* 1984, 1987) to assist in development of lexicon
- Panels T and U used 110 and 76 line scale attributes, respectively
- each panel established own training targets based on 90% confidence intervals

» during next four 2.5h training sessions
- panels calibrated with Compusense *FCM*™ to training targets that underwent further refinement
- use of ellipses in Compusense *FCM*™ provides range of correct responses, accommodating panelists with varying levels of ability to detect differences

» evaluation
- each panel evaluated the same 20 white wines in triplicate

An overview of the experiment is presented in Fig. 1, and discussed in detail in publication (Findlay *et al.* 2005).

Fig. 1. *Overview of experiment.*



Data analysis

» Data
- evaluation of the 20 white wines in triplicate

» Similarity of product configurations in sensory space
- inspection of GPA results (Findlay *et al.* 2004, Findlay 2005)
- permutation tests of RV coefficient (Findlay *et al.* 2005)

» Differentiation of wines by panel (per attribute)
- 2-way mixed model ANOVA (Findlay *et al.* 2005)
- quotients (range/LSD) for common attributes
  - range: scale distance between the maximum and minimum wine mean scores
  - LSD: Fisher's LSD (p=0.05)
  - reflects ability to discriminate the wines using the attribute; higher scores indicate greater ability to detect product differences
  - quotients documented approach for determining panelists' ability to differentiate products (Chambers & Smith 1993, and references therein)

» Scale usage by panelists
- panelist mean scores across all wines for 46 attributes that were used in the lexicons of both panels were submitted to centroid cluster analysis in SPSS (Release 9.0.1, 1999, SPSS Inc., Chicago, IL, USA)

» Differentiation of wines by panelists (per attribute)
- quotients calculated for individual panelists and submitted to centroid cluster analysis in SPSS
- groups identified by cluster analysis inspected to determine whether ability to differentiate wines reflected panel membership or other known factor
- PCA on correlation (corr) and covariance (cov) matrix of mean over sets conducted in Senstools (Release 2.3.6, OP&P, Utretch, The Netherlands)
- sets: 1; objects: panelist quotients; reps: n/a; attributes: 46 common attributes; rotation: none

results + discussion

» Similarity of product configurations in sensory space
- inspection of GPA results (Findlay *et al.* 2004, Findlay 2005) and permutation tests of the RV coefficient (Findlay *et al.* 2005) demonstrated strong similarity of the panels' product configurations in sensory space

» Differentiation of wines by panel (per attribute)
- wines well discriminated by both panels by 2-way mixed model ANOVA at p=0.05 (Findlay *et al.* 2005)
- Panel T had higher quotients than Panel U for 20 of 46 attributes, as shown in Table 1.
- suggests similarity in ability to detect differences

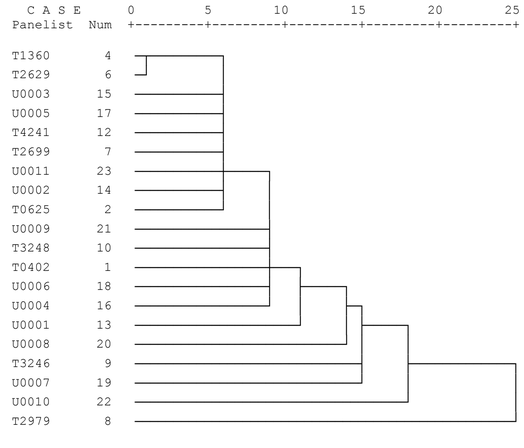
Table 1. *The following attributes were found in the lexicons of both Panel T and Panel U, and had similar or identical descriptors and reference standards. The 20 attributes differentiated better by Panel T, determined by a higher quotient (range/LSD), are presented in blue text. The 26 attributes differentiated better by Panel U are in red text.*

Aroma before stirring:	Aroma after stirring:	Taste/ Mouthfeel:
Apple, Peach, Melon, Pear, Pineapple, Rose, Mushroom, Earthy, Alcohol, Pungent, Resinous, Oak	Apple, Peach, Melon, Pear, Lemon, Pineapple, Rose, Asparagus, Mushroom, Earthy, Alcohol, Pungent, Honey, Vanilla, Resinous, Oak, Black pepper	Sweet, Sour, Bitter, Astringent, Mouth Burn, Smooth
		Flavour: Apple, Pineapple, Lemon, Grape, Rose, Oak, Alcohol, Pungent, Mushroom, Earthy, Vinegar

» Scale usage by panelists
- for each common attribute, panelist mean scores across all products were calculated
- centroid cluster analysis on the 46 attributes with similar or identical descriptors and reference standards produced panelist groups consistent with panel membership

» Differentiation of wines by panelists (per attribute)
- centroid cluster analysis didn't produce clusters that reflected panel membership (Fig. 2)
- neither corr-PCA nor cov-PCA explained a majority of total variance in first 2 principal components (26% and 31%, respectively)
- loadings plot from corr-PCA shown (Fig. 3) and checked for validity against data as recommended by Borgognone *et al.* (2001)
- cov-PCA similar but panelist configuration weakly suggests groupings by panel
- panel membership not driving attributes used by individual panelists to differentiate wines

Fig. 2. *Dendrogram resulting from centroid cluster analysis on quotients calculated per-panelist, per-attribute, which reflected the range between maximum and minimum mean scores for each panelists divided by the LSD. Cases labelled T#### and U#### indicate membership on panels T and U, respectively.*



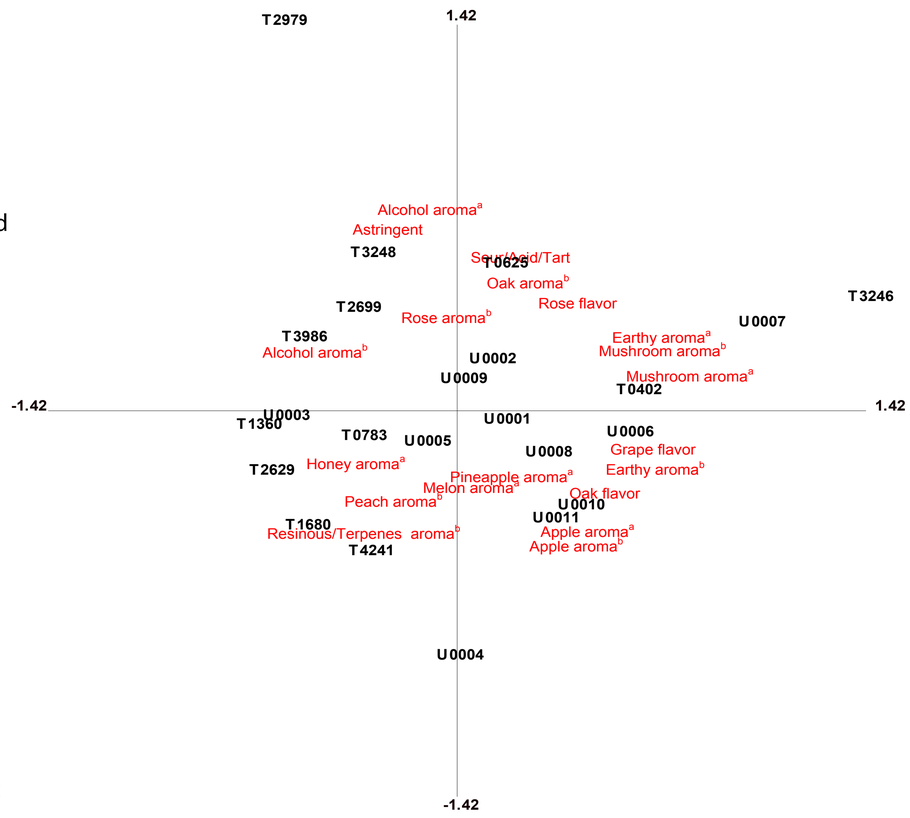


Fig. 3. *Principal Component Analysis on the correlation matrix of panelist quotients for 46 common attributes. Selected attributes, including several attributes evaluated before[b] and after[a] stirring the wine, are plotted on principal components 1 and 2, which explain 15% and 11% of total variance, respectively. Other labels follow conventions introduced in Fig. 2.*

conclusions

· a panel can use Compusense *FCM™*
- to generate, refine, and calibrate to its own training targets
- to differentiate products effectively
- to provide meaningful feedback to panelists with varying levels of ability to differentiate products for particular sensory attributes

· the panel's results are valid
- panels trained independently give similar product configurations and similar differentiation of products in spite of differences in scale usage

· panel membership
- reflected in groups formed from cluster analysis on scale usage data
- not reflected in groups formed from cluster analysis of panelists' quotients per attribute or corr-PCA, but weakly reflected in cov-PCA
- did not have a large influence on which attributes were used by individual panelists to differentiate wines in this study

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