**Beyond usability: designing for consumer’s product experience using the Rasch model.**

Camargo & Henson (2015)

Purpose of paper

* Determine the correspondence between the physical properties of a product and affective responses. Using Rasch theory to measure how the compliance of packaging elicits an intuitive impression of a moisturizer cream it is said to contain.
* New packaging was manufactured to determine whether the correspondence between compliance and affective response could be used to chose compliance of new products (no other factors were taken into account in the product design).

Notes

* A way to measure people’s emotional responses, sentiments or attitudes to products. These reflect latent variables or constructs which can’t be directly observed, and can’t be measured as easily as other objective product aspects.
* Rasch approach uses probabilistic models of peoples’ responses rather than descriptive statistics.
* It is a linear measurement, that demonstrates additivity and *invariant comparisons* – i.e. comparisons between individuals are independent of the statements and products, and comparisons between products are independent of the individuals and statements.
* Not yet widely used in product evaluation measurement.
* Novel research – demonstrates that a scale can be used to relate affective responses to physical properties of a product, and used to design new products.
* Multi-facet model – many people are evaluating many products against multi-categorical items.
* Rasch theory – computer-based iteration is used to determine whether data fit the model (as opposed to statistical approaches, where models are fit to data).
* Likert statements preferred to adjectives used in PCA – Rasch deals with unidimensional constructs (i.e. measuring one thing). It is difficult to identify a sufficient number of adjectives to describe a single construct (such as specialness).
* For use of multi-facet model, it needs to be demonstrated that statement locations are stable and don’t change with the addition of new calibrated items. This is a prerequisite for the implementation of CAT – the use of CAT should not affect any statement locations.
* Camargo and Henson (2013) study – showed that statement locations were stable, by recalibrating the statements with different group combinations from the same sample of people, and comparing t-test results.
* There is a trade-off between the internal and external validity of studies (i.e. the experimental precision vs an appropriate frame of reference).
* Dimension of interest – *impression*
* Required standard error – less than 0.5 logit interval in a two-tailed 95% confidence internal of +/- 2.0 (Linacre 1994).
* Response dependency between statements was tested by observing if the absolute item correlation residuals were greater than 0.3.
* Unidimensionality was tested via a PCA, and a subsequent paired t-test on the two most divergent subset of statements. Values <= 0.05 were taken to be unidimensional.
* Critical item-fit standard residual values - > +/- 2.5.
* Invariance across measurement structure – non-significant variance with chi-squared probability of 0.51.
* Non-significant response dependence – item-person residual correlations lower than 0.3.
* Scale unidimensionality – binomial test showed that fewer than 5% of the observations fell outside of t-range of +/- 1.96 (95% confidence internal).
* Container compliances of between 2.4mm/3N and 5.3 mm/3N would elicit the highest endorsement for giving a good impression of the product they were said to contain.
* PCA is more appropriate if an exploratory, multi-dimensional semantic space is needed.
* Possible challenge – the verbatim statements may possess some face-validity (i.e. superficial/subjective assessment), and responses to them may reflect an underlying construct.
* Asymmetric domination effect may have had an effect on the assumption of stimulus independence.
* Benefits of Rasch approach – ease with which outcomes of studies can be compared, and the ability to develop instruments that can be administered reliably to small samples

Definitions

* Principal component analysis – statistical technique,
* Kansei engineering – emotional or affective engineering. The development of products by translating the customer’s psychological feelings in terms of the physical elements of the design.
* Semantic space –
* Likert scale –
* Computerized-adaptive-testing (CAT) – a method in which additional statements are included within a questionnaire, based on the respondents previous answer. Results in a series of statements bracketing the individuals endorsement level.
* Frame of reference – term used by Rasch researches to refer to the concept that product evaluation should take place in the setting and circumstances in which the product will be used. Also referred to as *ecological validity* (by psychologists), and *context* (by product designers).
* Asymmetric domination effect – the concept that people’s preferences between two alternatives are affected by the relative attributes of as third option.

Queries

* With the Rasch approach, questionnaires can be calibrated and administered to small samples, and computer adaptive questionnaire implementations can be administered. This should substantially reduce the cost of measuring affective responses. As opposed to Nagamachi’s (1995) kansei engineering approach – large number of people are asked to rate a product against a number of adjective pairs, on multipoint scales. PCA is used to quantify responses and to correlate physical product properties with a semantic space. Change in product formulation means a repeat of the entire study. Is it simply the same size that means cost is reduced with the Rasch approach?
* Henson & Camargo (in press) investigation – Fabric locations were very similar on each scale, but statement and person locations were uncorrelated. What this this say about the fabrics? How exactly does the fabric place on the scale?

**Applying the Rasch Model to Measure Kansei Responses to Fabric Seats**

Camargo et al. (2014)

Aim

* Demonstrate that a quantitative correspondence between a scale for kansei responses and a scale for physical characteristics related to a fabric surface’s roughness can be established.

Method

* Used kansei engineering techniques to develop stimulus statements.
* Size of sample established according to metric stability, assuming 0.5 logit measurement error at 95% confidence interval level.
* Non-significant variance given by a chi-squared value >= 0.05

Notes

* Contributes sensory information from the physical contact along with the user’s impressions of an underlying product attribute.

Queries

* Why did the sample contain 94.8% males?
* Do the results suggest that the roughness height of the material has a stronger effect on user impression than the friction coefficient?