Comparison of Kansei Engineering and AttrakDiff to Evaluate Kitchen Products

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Abstract

Kansei Engineering can be used to create scales to measure perceptions and evaluations of products in a particular context. To what extent do specifically constructed Kansei scales reveal more information about a product than a more generic, prestructured instrument, such as AttrakDiff? This case study identified relevant affective and pragmatic Kansei attributes that influence the purchase of a range hood (cooker hood). 102 customers rated the extent to which each of 10 range hoods possessed these attributes. In addition, AttrakDiff was used to measure hedonic and pragmatic quality perceptions. There was a general high correspondence between AttrakDiff and Kansei. While Kansei provided richer and more specific feedback, it was more resource intensive to carry out.

Author Keywords

User experience; affective engineering; Kansei Engineering; Attrakdiff; evaluation.

ACM Classification Keywords

D.2.2 Design Tools and Techniques; D.2.1 Requirements/Specifications; H.5.2 User Interfaces

Combined hedonic factor	
	Loading
Kansei	
Unique Design	0.78
Looks High End	0.77
Looks Fashionable	0.77
High Tech	0.73
Good Looking	0.72
Looks Brand New	0.69
AttrakDiff Appeal	
Attractive/Pretty	0.77
Inviting	0.75
AttrakDiff Hedonic quality: Identification	
Novel	0.82
Inventive/Original	0.81
Creative	0.79
Innovative	0.79
Challenging	0.77
Captivating/Absorbing	0.75
AttrakDiff Hedonic quality: Stimulation	
Stylish	0.84
Presentable	0.74

Table 1: Items with highest loadings on the combined hedonic factor

Introduction

Kansei Engineering provides a means of analyzing affective as well as more pragmatic product perceptions and evaluations and incorporating them into design [8]. Kansei words (e.g., attributes, adjectives) can be then used as a semantic differential scale for evaluating a particular type of product. Since attributes are selected specifically (from a large pool of possibilities) for a particular group of products, the resulting scales can provide a rich and product-specific picture of relevant users' perceptions and evaluations. However, this advantage relies on a resource-intensive Kansei Engineering procedure. Consequently, other semantic differentials have been developed. For example, the now well-established AttrakDiff [2,4] is a generic scale, applicable to a wide range of different products. While much less resource-intensive, this generic method, however, might lead to different conclusions compared to the more finely attuned Kansai approach. The purpose of the present paper is to explore commonalities and differences between both approaches in the context of kitchen appliances.

Kansei and AttrakDiff

The essential steps of using Kansei Engineering to create a semantic differential scale are:

- Define the product and context-of-use to be evaluated.

- Collect as many relevant Kansei words and phrases as possible from various sources.

- Create a semantic differential scale from a representative subset of the words.

- Identify which features differentiate products and select products to be evaluated that have representative examples of the features.

- Recruit a large number of participants to evaluate the products using the semantic differential scale.

- Use factor analysis to identify Kansei factors.

- Compare the scores of each product on each factor.

AttrakDiff is a 28-item semantic differential to measure two broad types of quality perceptions: Hedonic quality and pragmatic quality [3,5]. Hedonic quality refers to a product's potential to support pleasure in use and ownership, that is, the fulfillment of psychological needs. This aspect is represented by two subdimensions: Stimulation and Identification. Pragmatic quality refers to a product's perceived potential to support relevant task achievement. In addition to pragmatic and hedonic scale, AttrakDiff provides a scale to measure general appeal. Appeal is conceptualized as a consequences of pragmatic and hedonic quality perceptions.

Study

This paper compares the results of evaluating 10 range hoods with a Kansei-based semantic differential scale and AttrakDiff. The study took place in Shanghai, China, in conjunction with a Chinese manufacturer of range hoods in October 2015. This paper uses English translations of the scale items that were presented in Chinese [6].

The research questions were: a) Does using the AttrakDiff attributes as general Kansei attributes [8] add value to Kansei Engineering? and b) How would the conclusions derived from use of the more product-

Combined pragmatic factors	
	Loading
User interface quality	
Kansei	
The button light is a refreshing color	0.72
The information displayed is clear	0.70
The button light is not dazzling	0.69
The button sound is pleasant	0.67
Not troublesome	0.64
The noise of the hood is quiet and relaxing	0.53 2
AttrakDiff Pragmatic quality	
Manageable	0.67
Clearly Structured/Clear	0.64
Simple	0.61
Straightforward/Facile	0.54
Smoke extraction quality	
Will extract all the smoke	0.78
High smoke gathering efficiency	0.76
High suction	0.74
Health benefit	0.62
Design quality	
Well coordinated	0.57
Does everything it is supposed to do	0.57
Well integrated	0.54
Simple and clean design	0.54
Easy to dismantle	0.53
Very stylish	0.52

Table 2: Items with highest loadings on the combined pragmatic factors

specific scale created by Kansei Engineering compare with use of the prestructured, generic AttrakDiff scale?

Method
Kansei Engineering is most often used to understand how to design products with attributes that will create positive emotions. In this case study the manufacturer wanted to understand the factors that influenced purchase decisions, so product function and interaction was also important. For this reason, we collected Kansei words relating to both hedonic and pragmatic aspects. The pragmatic words and phrases were not specific product features, but perceptions, such as: "high smoke-gathering efficiency" and "easy to clean".

Since Kansei is labor intensive, we employed a simplified version of the Kansei Engineering method, based on the Kansei Engineering toolkit for the packaging industry [1]. Table 6 summarizes the main differences between conventional [8] and Simplified Kansei Engineering. The steps in the Simplified Kansei Engineering method were:

- The context of use to be evaluated was making a purchase decision in a showroom.
- 10 customers were interviewed to find out where they obtained information about range hoods, what information they would have before making a purchase decision, and which physical features were most important.
- Data for potential Kansei scale items was obtained from marketing material and from two customer focus groups, and the most relevant 32 "hedonic" attributes and 34 "pragmatic" attributes were selected.

	Conventional	**Simplified**
Identify Kansei words	Identify about 1000 words including general Kansei words	Identify 50-100 words based on brand and customer perception
Select words for evaluation	Use about 600 words in a semantic differential to evaluate products, and based on a factor analysis select a representative subset	Select the most relevant words based on Kano analysis and rating of importance
Evaluation	Use 50-100 words in a semantic differential scale	Use 10-35 words in a semantic differential scale

Table 6: Main differences between conventional and Simplified Kansei Engineering

- 94 customers rated 10 range hoods using the 66 Kansei words on the 5-point Kano scale and gave each one an importance rating. Kano analysis [7] was used to select the 17 hedonic and 10 pragmatic words that had high scores for "more is better" or "surprise and delight" and that were judged as important.
- A semantic differential scale was created using the identified hedonic and pragmatic attributes and an additional five more specific pragmatic attributes of concern to the manufacturer.
- The features that had been identified by customers as most important were used to create a product-feature matrix so that products with a representative distribution of features could be used for the evaluation.
- Each of the 10 products to be evaluated was accompanied by a poster containing the information

Kansei hedonic factor	Loading
High-loaded items in the Combined Kansei scale	
Unique design	0.77
Looks High End	0.80
Looks Fashionable	0.86
High Tech	0.71
Good Looking	0.84
Looks Brand New	0.74
Additional items	
Smart and Delicate	0.78
Very Fine Finish	0.77
Three Dimensional Appearance	0.70
Very Stylish	0.68

Table 3: Items with highest loadings on the Kansei hedonic factor

about the product that customers would typically have.

- Customers were recruited to evaluate the products in a showroom-like environment, and rated them in a counterbalanced order using the 32 scale items and a Chinese translation of AttrakDiff, as well as additional items, including their willingness to buy.

- The scale item and AttrakDiff data were factor analyzed to identify the Kansei factors, and the ratings for each product on each factor were calculated.

Factor analysis

From factor analysis (principal components with varimax rotation) of the combined Kansei and AttrakDiff ratings of 10 hoods by 102 people, the four factors shown in Table 7 were identified. They explained 72% of the variance: 32% for the hedonic factor, and a total of 40% for the pragmatic factors.

The Kansei and AttrakDiff data were also factor analyzed separately. The Kansei data produced the same 4 factors with very similar loadings (Tables 3 & 4) as in the combined analysis (Tables 1 & 2).

The AttrakDiff data also produced the same two factors that had AttrakDiff items in the combined analysis with a similar order of loadings (Table 5). The hedonic factor was a combination of items from the three AttrakDiff subscales: Appeal, Hedonic quality (Identification) and Hedonic quality (Stimulation). The pragmatic factor was User interface quality.

The Kansei (Table 4) and combined (Table 2) factor analyses identified pragmatic factors related to user

Factor analysis: Factors	Comb -ined	Kansei		Attrak Diff	
	Variance Explained & α				
1. Hedonic	32%	28%	.96	43%	.97
2. User interface	16%	16%	.90	33%	.92
3. Smoke extraction	12%	14%	.91		
4. Design quality	11%	12%	.87		
Combined pragmatic	39%	43%			
Total	71%	70%		76%	
	Correlation with WTB				
1. Hedonic	0.49	0.48		0.48	
2. User interface	0.42	0.38		0.44	
3. Smoke extraction	0.43	0.43			
4. Design quality	0.49	0.49			
Combined pragmatic	0.48	0.48			

Table 7: Variance explained by each factor, Chronbach's alpha for the scales, and correlation of the scales with willingness to buy (WTB)

interface quality, smoke extraction quality and design quality.

We calculated a hedonic scale value and a pragmatic scale value for each method (Kansei, AttrakDiff) and each hood. All the scales had high levels of Chronbach's alpha (Table 7), indicating good internal consistency, although for the hedonic scales with $\alpha > 0.95$, some items are probably redundant [9]. There was a significant correlation between AttrakDiff and Kansei hedonic scales using the 10 highest loading items on each: $r(1068) = .92$ (Tables 3 & 5), and an 0.85 correlation between the AttrakDiff and Kansei pragmatic user interface scales using the high loaded items shown in Tables 4 & 5. The Kansei scales provide individual items that are easier to interpret to

Kansei pragmatic factors	
	Loading
User interface quality	
Combined Kansei scale items	
The button light is a refreshing color	0.76
The button light is not dazzling	0.75
The information displayed is clear	0.66
The button sound is pleasant	0.71
Not troublesome	0.51
The noise of the hood is quiet and relaxing	0.58
Smoke extraction quality	
Combined Kansei scale items	
Will extract all the smoke	0.80
High smoke gathering efficiency	0.79
High suction	0.79
Health benefit	0.63
Additional item	
Firm and Reliable	0.58
Easy to clean	
Easy to Clean	0.80
Easy to Dismantle	0.78
Outside Surface Easy to Clean	0.65

Table 4: Items with highest loadings on the Kansei pragmatic factors

understand the strengths and weaknesses of a range hood. The AttrakDiff items are less specific, but because they do not refer to any specific capabilities, the scales are also likely to be appropriate for other types of kitchen equipment.

Ratings for each product
Customers were asked which product they would most like to buy, and Figure 1 shows the products arranged in order of preference. The same order is used in Figures 2 and 3.

Figure 2 shows the ratings for each product on the Kansei and AttrakDiff hedonic scales. The ratings of the two scales are similar, and generally consistent with purchase preference (although the reasons for the willingness to buy P5 despite low ratings could be investigated).

Figure 3 shows the ratings for each product on Kansei items for the pragmatic factors shown in Table 4. Although the differences between products are smaller, the differences for all the factors are significant (at p= <.001). The Design quality factor shows the same pattern as Hedonic quality, while User interface quality and Smoke extraction quality are more varied. A scale using the 4 AttrakDiff items in Table 2 produced results very similar to those for Kansei User interface quality.

Although the hedonic and pragmatic factors have similar correlations with willingness to buy (Table 7), it is apparent that there is more agreement between customers on which products have desirable hedonic properties than which products have desirable pragmatic properties. Thus despite a correlation between pragmatic factors and willingness to buy on an
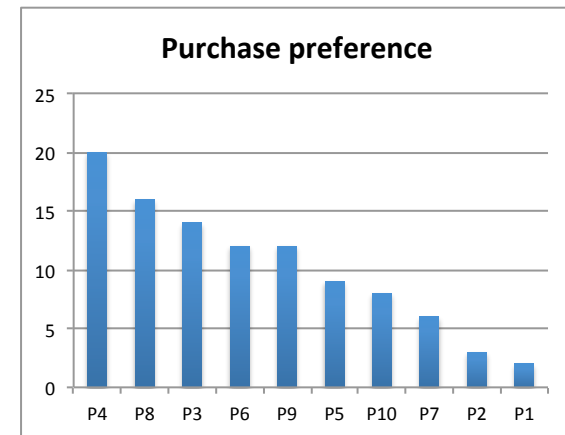

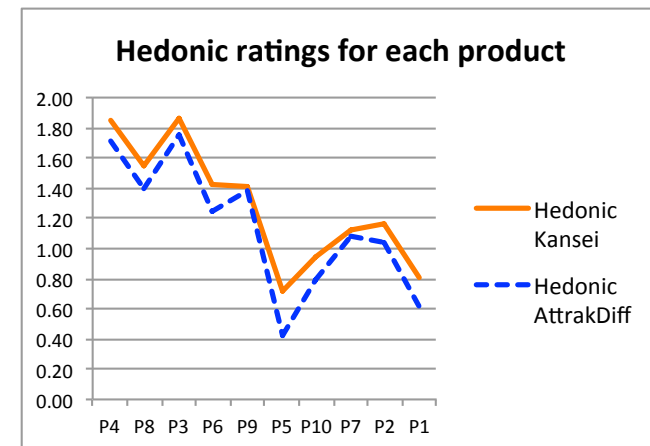**Figure 1**: Frequency of products that customers said that they would most like to buy.

Figure 2: Hedonic ratings for each product (scale +3 to -3)

individual level, there is a lack of agreement between customers about which pragmatic properties are more desirable. For this reason there were also no clear

AttrakDiff factors	
	Loading
Hedonic	
Attractive quality	
Attractive/Pretty	0.76
Inviting	0.76
Identification	
Novel	0.86
Inventive/Original	0.85
Creative	0.82
Innovative	0.83
Challenging	0.78
Captivating/Absorbing	0.77
Stimulation	
Stylish	0.85
Premium/High Quality	0.75
Pragmatic	
Simple	0.80
Practical and useful	0.80
Manageable	0.79
Straightforward/Facile	0.79
Clearly structured	0.76

Table 5: Items with highest loadings on the AttrakDiff factors

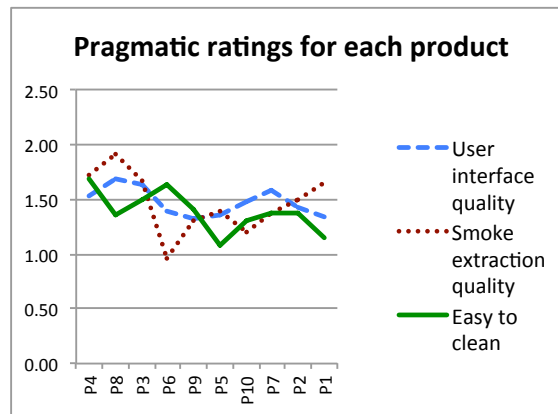**Pragmatic ratings for each product**

Figure 3: Pragmatic ratings for each product (scale +3 to -3)

correlations between Kansei factors and the identified product features. Further analysis of the data may reveal distinct groups of customers, differentiated by their preferences, which could show clearer relationships between Kansei scale ratings and product features.

Conclusions

The research questions were:

a) *Would using the AttrakDiff attributes as general Kansei attributes add value to the Kansei Engineering analysis?* Including AttrakDiff attributes in the combined analysis did not change the factor structure and did not make the factors any easier to interpret. From this perspective, the addition of AttrakDiff to Kansei does not have any additional benefit.

b) *How would the conclusions derived from use of the Kansei Engineering scale compare with use of the AttrakDiff scale?* A scale composed of a subset of AttrakDiff items provides at least as good an evaluation of hedonic quality as a scale based on the identified Kansei items, although the AttrakDiff scale provides less detailed, product-specific feedback. As would be expected, Kansei Engineering identifies more product-specific pragmatic factors and individual scale items are also easier to interpret. So using Kansei factors and AttrakDiff to evaluate products provide different benefits. Future analysis will include the results obtained by using the complete AttrakDiff scale and subscales, and investigation of which scales have the highest correlation with buying preference.

Although the resources required for Kansei Engineering are unlikely to justify a one-off evaluation, they can provide rich and useful data for tracking and comparing hedonic and pragmatic quality for a particular type of product and usage context. And it is generally possible to relate the Kansei factors to specific product features. So designers could use Kansei Engineering early in product development to get actionable insights that could help improve design. AttrakDiff could be used as a quick evaluation tool to compare products and check that the designs meet the customer needs. Products with long timescales and relatively large budgets (such as automotive design) are more likely to find Kansei Engineering cost-effective, while consumer products with tight budgets and short timescales may find it more beneficial to use AttrakDiff.

Acknowledgements

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