

2006

# January

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Column from University of Palermo:

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# Integrating Kansei Engineering and Conjoint Analysis in Product or Service Development Strategies

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In dynamic business environments, where quality is an essential part of an organisation's success, peoples' need for emotional satisfaction is growing. Affective properties are therefore, emerging as important factors for evaluation when developing new products or services.

In the last two decades many methodologies have been developed to facilitate the integration of affective aspects, such as emotions and consumer perceptions, into product design in order to fulfil the requirements of customers. Kansei Engineering is one of these methodologies; this method utilises a multi-disciplinary approach, employing tools from several fields such as social sciences, psychology and statistics.

The Quality Management and Technology group at the University of Palermo is carrying out research to illustrate how statistical methods might be used to support a Kansei Engineering procedure for a product or service. Several steps are involved in this procedure. Starting from the choice of the domain, two spaces are explored: the *semantic space* and the *physical properties space*. The semantic space is explored by collecting 'kansei' words that describe the domain and these are then reduced in number using quality or statistical tools.

The exploration of the physical properties space involves similar activities, such as the identification of properties (attributes) for the product or service and the selection of samples that represent the selected properties. The two spaces are then merged in the synthesis phase and the results are used to create the relation model, predicting how different product or service properties will affect the perceived level for each Kansei word. The results of a Kansei Engineering procedure allows companies to understand which product or service strategy is the most appropriate for the chosen domain. Figure 1 schematically shows this procedure.



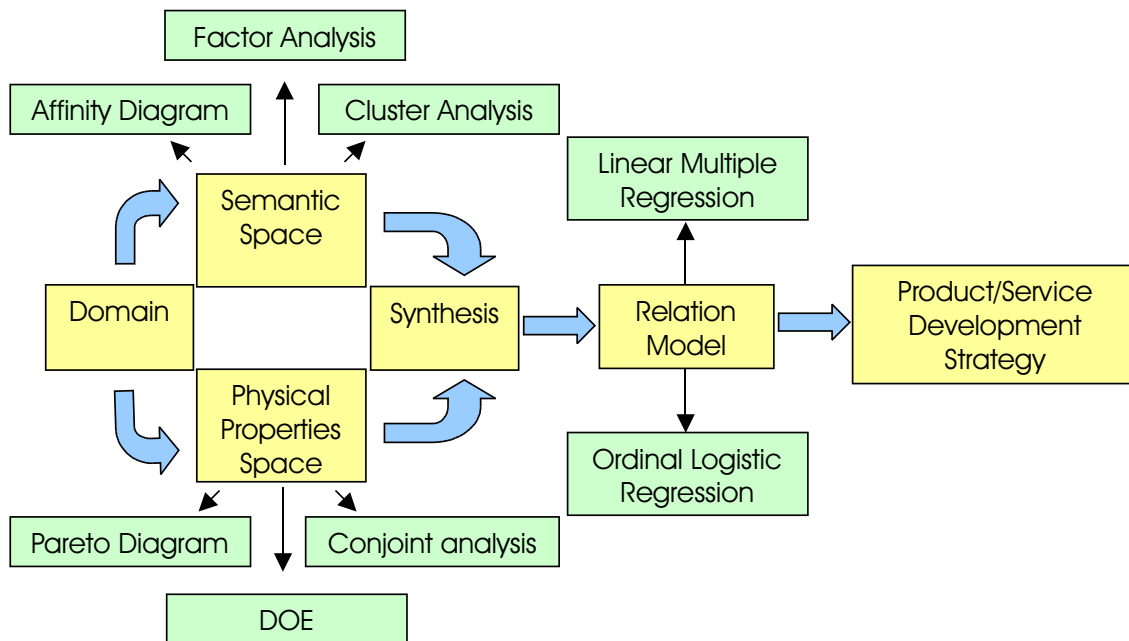


Figure 1: Kansei Engineering schematic procedure (adapted from Schütte, 2002) and involved statistical/quality tools.

One Kansei Engineering phase is still described unclearly in the literature. This phase is the selection of product samples representing the attributes, that is, the physical properties which are important to the customers. Conjoint Analysis is a technique using design of experiments to identify the best configuration of product attributes for potential customers. This technique is not always directly suitable for Kansei Engineering. In fact, we know that the ideal situation is to evaluate all theoretically possible concepts, i.e. all combinations of attribute levels included in the study (full factorial design). In practice the surveys are not performed as full factorial designs, but rather as fractional factorial design, in order to add more attributes to the concepts without increasing strain on the respondents. The product or service samples are those representing the attributes combinations in such designs. Unfortunately, if the experimenter takes these samples from those already present in the market, they do not only represent the above combinations, but are characterised by several other elements, such as brand. These elements constitute a “noise” in the synthesis phase where respondents are evaluating product samples against the same Kansei word. In this situation the experimenter is unsure whether the results of the product evaluation are due to the “signal” (the attribute combination represented by the sample) or the “noise” (shape, strange design, material, brand, etc.). The problem might be overcome by trying to understand the relative importance of the chosen product attributes, for customers.



Conjoint Analysis studies have used different methods for measuring the relative importance of attributes. These methods can be divided into two approaches: ranking and rating; both approaches have advantages and disadvantages. For instance, in Barone and Lombardo (2004), the sequentially selected scenarios are presented again to the interviewed customer, for assigning a score to each of them (rating). Therefore, the customer has to interact with the interviewer on two occasions, the first time they select attributes and the second time they evaluate the scenarios. This procedure enables the customer's opinion of the scenarios to be identified but it also adds a second step to the interviews, increasing the chance of the respondent losing interest or concentration.

In the research work carried out in Palermo, a new procedure has been adopted in an effort to solve this. The customer's opinion is indirectly captured using the time taken (choice time) for them to choose individual product attributes during the selection process. Therefore, during the Conjoint Analysis interviews, the data collected includes the preferred product attributes, in order of preference for each respondent, as well as the choice time for each attribute. From measuring choice time and using the proposed method, it is possible to extrapolate from each respondent the "magnitude" of importance for each attribute. Using this method, a comparison between the respondents' opinions of the importance of each attribute is also possible. This new methodological approach was applied in a mobile phone case study. An example is given in the table 1 and figure 2.

Attributes	t*	times	Coefficients	Attributes importance
Music Support	1000	4514	1,22	0,31
Internal Memory		2031	1,49	0,26
USB 2.0 port		2702	1,37	0,17
Dimension		1968	1,51	0,12
VGA camera		1968	1,51	0,08
Antenna Integrated				0,05
				1

Table 1: Calculation of the relative importance of each attribute



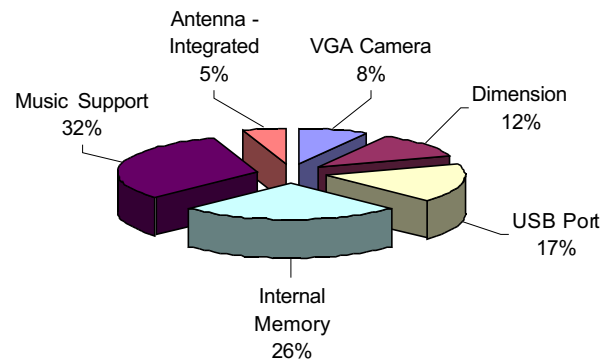


Figure 2: Image of the phone used and the importance of its attributes

The grade of importance for the attributes will be used as weights in an ordinal logistic regression model. This model is used to form links between physical design elements and subjective consumer responses. It is particularly useful in cases where response variables are categorical with three or more possible levels with a natural ordering, as in a Likert scale. Table 2 presents an example of Ordinal Logistic Regression output.

Design Attributes	Level "n" (vs. Level)	Logistic Coefficient	SE Coefficient	P	Odds Ratio	Confidence Interval 95%	
						Lower	Upper
<b>Kansi word - ORIGINAL</b>							
<b>Antenna Integrated</b>	Yes (vs. No)	-4,418	1,127	0,000	0,01	0,00	0,11
<b>Dimension</b>	Very Small (vs. Small)	-10,020	1,059	0,000	0,00	0,00	0,00
<b>Internal Memory</b>	Big (vs. Small)	-0,4097	0,9296	0,659	0,66	0,11	4,11
<b>USB port 2.0</b>	Yes (vs. No)	-2,991	1,192	0,012	0,05	0,00	0,52
<b>Music Support</b>	Yes (vs. No)	0,674	1,226	0,583	1,96	0,18	21,70
<b>VGA Camera</b>	Yes (vs. No)	-6,130	1,358	0,000	0,00	0,00	0,03

Table 2: Weighted Ordinal Logistic Regression output for the Kansei word "Original"



The ordinal logistic regression analysis reveals that there are several design elements influencing the user's impression. The table, related to the Kansei word "Original" (one of the eight Kansei words used in the study), show that a "good original" evaluated mobile phone has the antenna integrated, a USB port and a VGA camera. An unmarked influence came from technological and innovative parts of a mobile phone, such as, internal memory and the possibility to support music. An essential design element for a mobile phone was its physical size, with small being the most desirable; this is identifiable by the logistic coefficient for dimension, in table 1, being higher than the other attributes.

Using this new methodology companies can develop products or services that meet or exceed the customers' affective requirements and contribute towards delighting them further.

Barone, S. and Lombardo, A. (2004) Service Quality Design Through a Smart Use of Conjoint Analysis. *The Asian Journal on Quality*, 5(1), 34-42.

Kano, N. (1984) Life Cycle and Creation of Attractive Quality. University of Tokio

Schütte, S. (2005) Engineering Emotional Values in Product Design, Kansei Engineering in Development. Linköping Studies in Science and Technology, Dissertation No.951.

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# Events Calendar

This diary includes Engage events and related events that may be interesting for the Engage community.

## Technology, Entertainment and Design - TED2006 Conference

Date: 22-25 February 2006  
Location: Monterey, California, USA  
Website: <http://www.ted.com/ted2006/index.cfm>

## Applied Ergonomics Conference 2006

Date: 6-9 March 2006  
Location: Lake Buena Vista (Orlando), Florida, United States  
Website: <http://www.appliedergo.org/conference/>

## The 2006 Art Center Design Conference

Date: 23-26 March 2006  
Location: Pasadena, California  
Website: <http://www.artcenter.edu/designconference/>

## 1st International Conference on Happiness & Its Causes

Date: 12 April 2006  
Location: Sofitel Wentworth, Sydney, Australia  
Website: <http://www.terrapinn.com/2006/happiness/>

## Ergonomics Society Annual Conference 2006

Date: 4-6 April 2006  
Location: Robinson College, Cambridge  
Website: <http://www.ergonomics.org.uk/events/AC2006call.htm>

## International Symposium on Intelligent Environments

Date: 5-7 April 2006  
Location: Homerton College, Cambridge  
Website: <http://research.microsoft.com/ero/iep/isie06/>

## Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT)

Date: 10-12 April 2006  
Location: Fitzwilliam College, Cambridge, UK  
Website: <http://rehab-www.eng.cam.ac.uk/cwuaat/>

## CHI 2006

Date: 22-27 April 2006  
Location: Montréal, Quebec, Canada  
Website: <http://www.chi2006.org/>



### Good Experience Live (GEL 2006)

Date: 4-6 May 2006  
Location: New York City, USA  
Website: <http://www.goodexperience.com/gel>

### InnoTown

Date: 29-31 May 2006  
Location: Ålesund, Norway  
Website: <http://www.innotown.com/>

### 9<sup>th</sup> International Design Conference: Design 2006

Date: 15-18 May 2006  
Location: Dubrovnik, Croatia  
Website: <http://www.designconference.fsb.hr/?>

### 5<sup>th</sup> International conference for interaction design and children

Date: 7-9 June 2006  
Location: Tampere, Finland  
Website: <http://www.cs.uta.fi/idc2006/index.html>

### Research Into Practice Conference

Date: 7-8 July 2006  
Location: University of Hertfordshire, UK  
Website: <http://www.herts.ac.uk/artdes1/research/res2prac/>

### Usability Professionals' Association - UPA 2006

Date: 12-16 June 2006  
Location: Denver/Broomfield, Colorado  
Website: [http://www.upassoc.org/conferences\\_and\\_events/upa\\_conference/2006/index.html](http://www.upassoc.org/conferences_and_events/upa_conference/2006/index.html)

### 16<sup>th</sup> IEA Conference 2006 and Symposium of ergonomic analysis of work activity and training.

Date: 10-14 July 2006  
Location: Maastricht, Netherlands  
Website: <http://www.iea2006.org>

### 5<sup>th</sup> International Design and Emotion Conference

Date: 27-29 September 2006  
Location: Gothenburg, Sweden  
Website: <http://www.designandemotion.org>

### London Design Festival

Date: 15-30 September 2006  
Location: London, UK  
Website: <http://www.londondesignfestival.com/>



## ICDVRAT 2006 - International Conference Series on Disability, Virtual Reality and Associated Technologies

Date: 18-20 September 2006

Location: Musikhuset Esbjerg, Centre for the Performing Arts and International Conferences, Denmark

Website: <http://www.icdvrat.reading.ac.uk/>

## ICSID/IDSA CONNECTING '07

Date: 17-20 October 2006

Location: San Francisco, USA

Website: <http://www.idsa.org/icsid-idsa07/connecting.html>

## 2nd International Conference On Universal Design

Date: 22-26 October 2006

Location: Kyoto, Japan

Website: <http://ud2006.iaud.net/>

## World Creative Forum

Date: 2006 to be confirmed

Location: to be confirmed

Website: <http://www.worldcreativeforum.com/site.html>

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Do you know of any conferences or events that may be of interest to the Engage members?

if you do, please e-mail the details to:

[j.d.mason@lboro.ac.uk](mailto:j.d.mason@lboro.ac.uk)

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# engage news

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