

Joint International Conference

# APCHI-ERGOFUTURE-PEI-IAIFI 2014

"With new mind set and widen horizon to catch the future: Physiology is the basic science for human life"  
UDAYANA UNIVERSITY, DENPASAR – BALI – INDONESIA  
OCTOBER 22-25, 2014



## Programme Book

# BALI 2014





# Programme Book

Joint International Conference  
**APCHI-ERGOFUTURE-PEI-IAIFI 2014**

"With new mind set and widen horizon to catch the future: Physiology is the basic science for human life"

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## WELCOME FROM CONFERENCE CHAIR



*Om Swastyastu,*

Based on long experiences working in Human Computer Interface (HCI), Ergonomics (Erg), physiology, occupational safety and health (OSH), up to now we are practically still running at the same place. Accident or occupational diseases in fact still happening, even in the workplace equipped with up to date regulation and personal protected devices. Unsafe acts and unsafe behavior must be managed to develop safety behavior. Mindset changes become an important issue to be success. To solve that problem. Balinese Branch of Indonesia Ergonomics Society supported by APCHI, PEI, IEA, IAIFI, Center of Ergonomics Study of Udayana University and Bali Human Ecology Study Group (BaliHESG) organize the Joint Internasional Conference APCHI-ERGOFUTURE-PEI-IAIFI 2014. The conference will be held at Udayana University at Jl. P.B Sudirman, Denpasar - Bali on 22 – 25 October 2014.

The goals are. 1. To provide guidance and direction for young ergonomists, 2. To show the unfit, improper, inappropriate research and application of ergonomics, physiology, computer interface, and OSH, 3. to convince that a total and a more strategic approach must be done in conducting research and application with aimto have maximum benefit.

The scientific program of APCHI-ERGOFUTURE-PEI-IAIFI 2014 including : 1) workshops and tutorials, 2). Keynotes address, 3) Free communication (parallel session) of various topics of physiology, human computer interface, ergonomy in small scale industries, children, women, cognitive ergonomy, MSDs, office, communities, agriculture, architecture, etc. and 4) Field Visit and Tour to Bali best tourism object (on request). To make the conference more successfully, the organizing committee invited overseasparticipants to participate in the conference. Bali is a paradise island with unique attraction culture shall becoming unforgettable experience to all participants.

*Om Shantih, Shantih, Shantih Om,*

**Conference Chair**

**Dr. Ir. Putu Gde Ery Suardana, M.Erg**

## GREETINGS AND BEST WISHES TO THIS CONFERENCE



Dear Hosts, Conference organizers, colleagues, and friends,

I would like to use this opportunity to express my congratulations to you for all your efforts and hard work to organize such an important event. Your dedication for promoting ergonomics discipline and profession as well as sharing and enlarging ergonomics knowledge has resulted in this well-organized conference with great contributions. I attended a previous APCHI-ErgoFuture Conference back to 2010, I was positively impressed with the work done by Indonesian scholars.

It is impressive to see how Indonesian researchers dedicate their work on solving local ergonomics needs while reaching out to the world. I truly support your efforts to apply ergonomics knowledge to the priority needs of the local and national community. I recognize clearly the great commitment of the organizers in continuing their efforts of hosting this conference again in four years short. It is equally important to satisfy local ergonomics needs and to network the international ergonomics community.

This conference hold in Bali, Indonesia, has served as an important platform for local and foreign participants to communicate, exchange knowledge and experience, as well as discuss and realize new ideas and mutual cooperation. It is an important event for the big ergonomics family, and is shaping the future development of ergonomics not only in this region but also globally. I hope our efforts could continue and make this conference in a regular basis, so the experience of the pioneers and their contributions could be carried over from generation to generation. Let this event be a place where we will regularly see old friends and meet new friends. Please accept my congratulations and best wishes to the success of our hosts' efforts and this conference!

**Eric Min-yang Wang**  
**President, International Ergonomics Association**



## CHANGING MIND SET AND WIDENING THE HORIZON TO ACHIEVE BETTER FUTURE



Recently we are facing various complex development problems which should be anticipated, - within our limitation -, in attaining our goals to enhance the quality of life and working life of the people at large. Impacts of Globalization, Global Warming, Eruption, Earthquake, 24 hours society, flooded area, drinking water shortage, are some of the problems we have to face and to anticipate.

And for a small island with all its limitation, likes Bali, in anticipating all those problems should be able to carry out a smart and wise development policy, likes to conduct "Development for Bali" and not "Development in Bali". There is no choice for Bali except to carry out sustainable development, using the three economic potentials: agriculture, tourism and small scale industry in synergist as means to attain the goals. To be different and winning the competition, cultural tourism must be utilized in developing tourism. Agriculture and Small scale industry should be able to show its consistency as the backbone of Bali's economy in crisis.

In all those activities ergonomists and ergonomics associations should be able to give their strong contribution and should be able to play a role as playmaker due to its position and strong role in human-machine-environment interface.

As the problems are so complex a Total Ergonomics Approach which consist of SHIP and Appropriate Technology approaches must be utilized. And to conduct such an approach, mind set change of the human resource must be developed. Holistic thinking and act must be empowered. Team approach must be conditioned. Egoism and arrogant attitude must be thrown away.

And through ergo future 2006, 2010 and 2014, we try to aware the problems, to empower the human resource and to enhance the capability of tools to support. Therefore we have to thank everybody who have already given their concerned and commitment to this efforts by supporting the conferences in various means.

We shall not stop the efforts only by organizing conferences, but beyond that. Fundamental efforts have been planted and time to grow it together by academician, government and people at large, has already come.

Finally welcome to all participants in the conferences and let us make a jump in our endeavor to enhance the quality of life and working life of the people.

Please enjoy your visit scientifically and culturally. Thank you.

**Prof Emeritus Adnyana Manuaba**  
**Initiator Ergofuture**

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# The Exterior Form Design of Men Formal Shoe with Kansei Engineering Through Structure of Meaning

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**ABSTRACT:** Shoe is a product which develops by using technology design and the management of marketing. A number of studies have been conducted, by analyzing the relationship between the shape and the consumer's emotional and impression as known as Kansei Engineering (KE). While the methods are collect the similar product range to produce the forming factors of elements design for the product on another the involvement of designer is very important to build a model design. In this study, meaning structure is used to translate the customer's impression meaning. In this study all kansei adjectives are developed by NetWord database. Therefore, Validation results in cluster A is much strong while for "classic" from Cluster B is relatively poor. Finally it can be concluded that the development design using meaning structure for product allows the shoe designer or craftsmen can translated the customer's need in men formal shoe as long as an adjectives target is provided by the WordNet database.

**Keywords:** Product Design, Kansei Engineering, Shoe, Structure of meaning, WordNet

## 1 INTRODUCTION

Shoe is a commercial product that aims to support the person's appearance for make them good looking and of course taking into the comfort of its users. One of shoe industry in Indonesia there is in Manding Yogyakarta, there are many kind of handicraft is produced by lather material. In Manding the customers can make their own shoe model, but they have some problems to execute this marketing model. One of the important problem is how to design and translating the customer need at the same time. The aim of this study is how to translate the customer's impressions with meaning format into the design, where this paper use the men formal shoe as the object and focus on the exterior form.

There are some methods are developed to build the design based on customer need, they are Quality Function Deployment (QFD) (Akao, 1990), Conjoint Analysis (Green dan Srinivasan, 1990) Voice of Customer (VoC) (Griffin dan Hauser, 1993) dan Kansei Engineering (Nagamachi, 1992). According to Lokman (2010) QFD, Conjoint Analysis and VoC methods are focused to the analysis on the explicit of customer's need and develop design requirements that

to match these need. While the Kansei Engineering is specifically use to analyze the customer's implicit needs and associate them with product design characteristic, so that a guide to the new design

## 2 LITERATURE STUDY

### 2.1 *Kansei Engineering Method Model*

Copy the The development research of Kansei Engineering method is focus on the distinction of implication in image impression, words and elements of design. Research from Shang et. al. 2000 declare that the designer and customer as a product user have a different perception in the same product. However, the designer can't be separated with customer, in this case kansei engineering give a bridge to connect each other. Many methods are developed by collecting the existing product and extract the elements of design, as done by Nagamachi. 1995, Bianchi-Berthouze. 2001, and Schutte. 2002. In other hand the designer as the important element in design method slightly be ignored. Ogawa, et.al. 2008, suggest the kansei ideas are entered for the first step to transform into the element in the engineering approach for display product using meaning structure.



## 2.2 Structure Of Meaning Method

The concept design using meaning structure are developed by database of WordNet, for the first WordNet::Similarity has been use to evaluate the meaning of each word. And then by using Visuword, the word as an input are developed with search a new meaning, where the new meaning will accepted if its convergace evaluation more than the meaning input ( $r_{input} > r_{output}$ ). Based on the new meanings the designs are developed where the inteprete design is fully depend to the designer or craftsmen.

The steps of design methodology described below are part of the structuringthe meanings phase of conceptual design in the framework, which is the focus of this study.

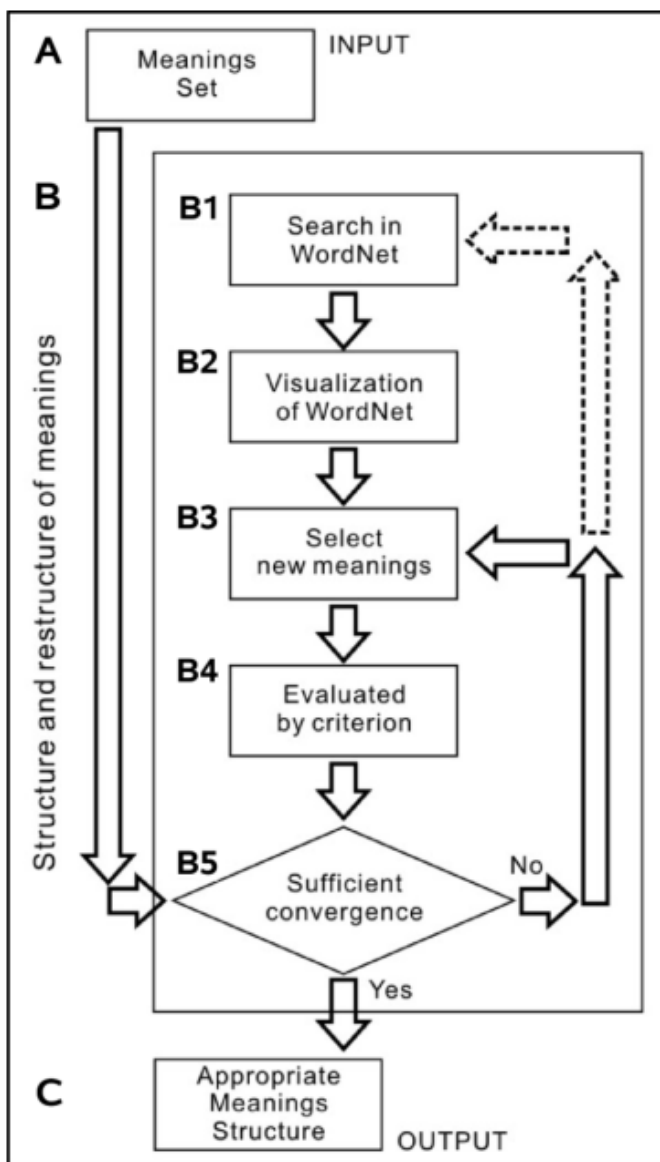


Fig.1 Structure Meaning Method Flowchart (Georgiev et al., 2008)

The design methodology uses the following precise procedures for meaning search and evaluation (Fig. 2). It corresponds to the stages A-B-C in the framework presented in the previous figure. Stage A in-

volves the meaning set used in the design methodology; Stage B entails building the structure of meaning using search and evaluations and Stage C is the resulting appropriate meaning structure (Fig. 1). The steps are:

- Meanings set refers to the starting point of initial concepts (meanings) that relate to the design task and abstracted meanings from the task (A)
- Search in WordNet with these meanings (B1)
- Visualization of WordNet as a network neighborhood of searched meanings (example is provided in Figure 3) (B2)
- Designer selects new meanings (concepts) from this neighborhood network (Figure 3) (B3)
- New meanings are evaluated by convergence criterion form WordNet::Similarity (B4)
- If the meanings do not show sufficient convergence criterion, the designer returns to one of the previous steps, i.e. the designer selects new meanings (concepts) or searches using new input (B5) to evaluate them :

The similarity  $S$  is a real number between 0 and 1 defined as in Equation 1. With  $m_1$  denoting 1,  $m_2$  denoting meaning 2, and path  $p$  is measured in steps, in the WordNet database.

$$S(m_1, m_2) = \frac{1}{p} \quad (1)$$

And then the relatedness of that meanings is applicable as comparative criteria between the pairs of meaning, thus convergence  $R$  is evaluation of relatedness or similarity of a limite set of meanings, defined as the average value (Equation 2) of all meanings similarities  $S$  by shortest path in the WordNet databaase ( $M$  is the number of meanings)

$$R = \frac{1}{M^2} \sum_{i=1}^n S_i \quad (2)$$

- The process continues until a good score on convergence criterion is achieved or until the designer decides that the meanings are appropriate (B1–B5). The steps are repeated until an improved and appropriate structure of meanings is attained.

## 3 DESIGN TASK

### 3.1 Collecting Kansei Word

There are 20 Kansei word are collected from the observation in media information and interview to customer. As a recommendation from osgood

et.al.1957, to effectively and correctly define in questioner evaluation the word kansei adjectives must selected. Lamb and Kallal. 1992 gave the same recommendation, that used expressive adjectives for Kansei selection principles to describe customer's emotional responses to the product. Finally, though cluster analysis its form into two cluster, cluster A : Elegant, Stylish, Firm, Sturdy, Mature, Enthusias, Luxury, Cluster B : Modern, Simple, Gallant, Classic, Attractive.

### 3.2 Similarity and convergence criteria

The next step is analyze the relatedness and convergence criterion between the seven input in cluster A (shown in tabel 1) and five input in cluster B (shown in tabel 2). Note that, each pair of words has different similarities, the calculated convergence score for cluster A: 0.186 and cluster B: 0.165 are considered to be relatively low (Georgiev, et al.2007). Hence, the aim to achive a better convergence score, while keeping the meaning close of to the initial meaning pair. Using the Kansei adjectives as an input the design methodology continues eith search and visulaization to help the designer to choose new meanings (fig. 2) .this proses focuses on meanings an replacements with closer meanings and of course can give better total convergence of the whole set of meanings.

Tabel 1. Convergence score input cluster A

0.186	Elegance	Stylishness	Firmness	sturdiness	Maturity
Stylishness	0.5				
Firmness	0.2	0.17			
sturdiness	0.17	0.14	0.5		
Maturity	0.2	0.17	0.2	0.17	
luxuriousness	0.13	0.11	0.13	0.14	0.17
enthusiasm	0.13	0.13	0.17	0.14	0.17

Tabel 1. Convergence score input cluster B

0.165	Attractiveness	Modern	Simple	Classic
Modern	0.13			
Simple	0.11	0.33		
Classic	0.09	0.2	0.2	
Gallant	0.13	0.2	0.2	0.14

The convergence of the local WordNet structure for meanings of the word "Stylishness" and "Elegance" as shown in fig. 2. This graph shows different possibilities for convergence of the input meaning. The meanings of the word "dash" is visualize on fig. 2 on the basis of these visualization the replacement meanings are chosen by the designer or craftsmen.

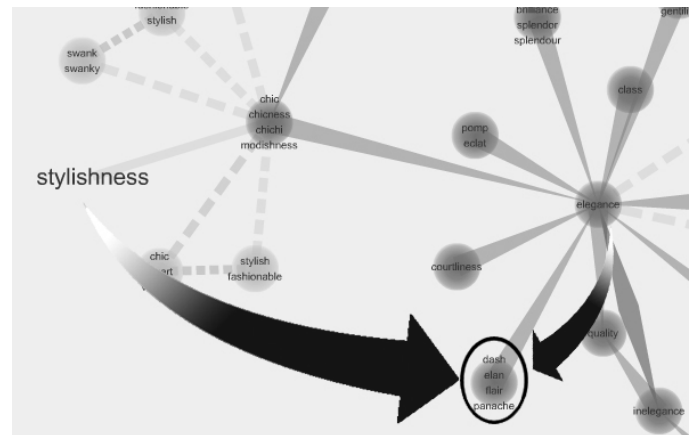


Fig. 2 Visuword Stylishness and Elegance

As a result of the visualization, it was decided that the meaning in cluster A would be replaced by dash, stockade, peak height, exuberance and for cluster B would be replaced by binding, plain, crown, bodoni, piece, composition.

Tabel 3. Convergence score developed cluster A

0.216	dash	stockade	Peak	Height
stockade	0.11			
peak	0.17	0.14		
height	0.14	0.07	1	
exuberance	0.13	0.7	0.17	0.17

Tabel 4. Convergence score developed cluster B

0.232	binding	plain	crown	Bodoni	piece
plain	0.33				
crown	0.25	0.25			
Bodoni	0.08	0.1	0.13		
Pieces	0.2	0.25	0.2	0.11	
composition	0.2	0.14	0.14	0.09	1

Further evaluating all the replacement, the new convergence score of the set five meanings in cluster A is calculated 0.216 ( onve 3) and for cluster B is 0.231( onve 4). As a result, it is higher than the initial onvergence score cluster A  $0.216 > 0.186$  and



cluster B  $0.231 > 0.165$ . The higher convergence will possible give beeter design results (georgiev, et al., 2007).

#### 4 PROTOTYPING

The design task in this stage was trasnferring those meanings to the idea shape of the product. The stage after application of the core methodology, conitined with design the shoe using Shoe Maker 3D design<sup>®</sup> shown in fig. The develop of design, there are some factor has decided shape layout for each caraceristics, where this stage is fully interface base on the designer.

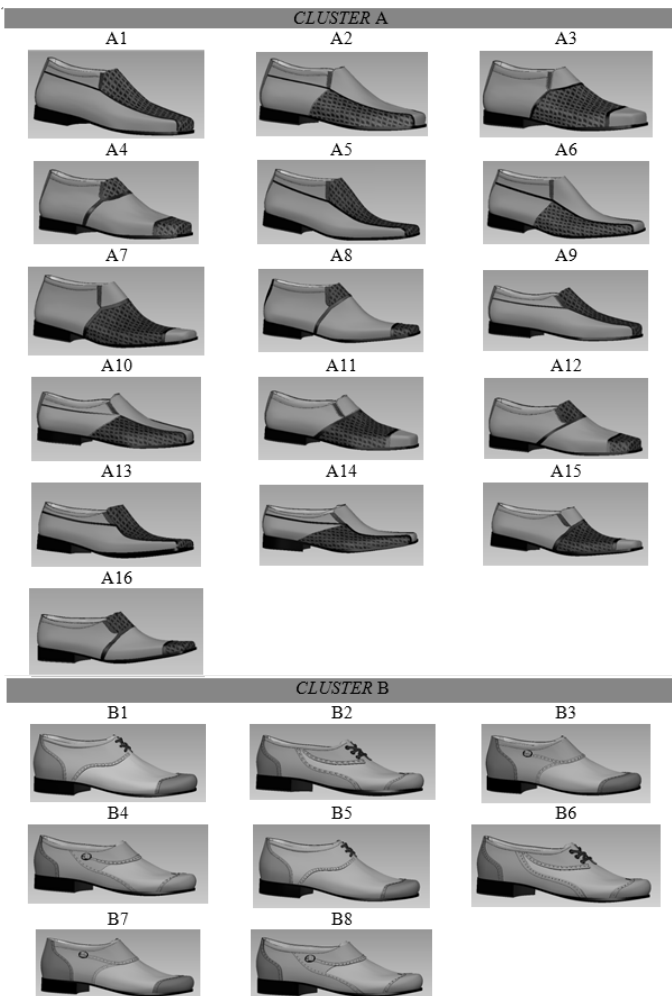


Fig.3 Shoes Design using Shoe Maker<sup>®</sup>

#### 5 EXPERIMENT OF MEANING QUESTIONNAIRES

During Kansei research, questionnaires or experiments are typically used to obtain user's preceptions (psychological felling and image) on a product. This research uses a questionnaire in five scale to collect costomers emotional image reaction to ward men formal shoe appearance and form. The total 24 ex-

perimental 3D rendered image are divided into cluster A and cluster B.

Twenty-four adult men (> 22 years old) who are college students responded to the experimental questionnaire. The experiment was conducted by having the participants view the experimental 3D design shoes. The shoe design were shown on a 3D questionnaire to avoid any errors effect.

#### 6 VALIDATION AND RELIABILITY TEST

The purpose of this test are validating the kansei adjectives againts the design. This test based on the experiment data from the questionnaire that processed by using SPSS version 1.6. The kansei adjectives would stated valid if alpha conbrace score  $r_{cal} \geq r_{tabel}$  in significancy 5% with two tales and n data = 24 so the degree of freedom is  $24-2 = 0.404$ .

Tabe 5l. Result of Validation test

No	Kansei Adjectives	$r_{cal} = r_{tabel} > 0.404$	Expl.
1.	Elegant	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
2.	Mature	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
3.	Luxury	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
4.	Firm	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
5.	Stylish	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
6.	Enthusias	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
7.	Sturdy	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,A15,A16	Valid
8.	Classic	B2,B5,B6	unvalid
9.	Modern	B2,B3,B4,B5,B7,B8	Valid
10.	Attractive	B1,B2,B3,B4,B5,B6,B7,B8	Valid
11.	Gallant	B1,B2,B3,B4,B5,B6,B7,B8	Valid
12.	Simple	B1,B2,B3,B4,B5,B8	Valid

The result shown in tabel 5, all the kansei adjectives in cluster A are valid and they have a good corellation as shown for the reliability score with rages 0.886 – 0.951. whilr in cluster B “classic” is stated unvalid because of the correlation comparison, just 3

design are more than  $r_{\text{tabel}}$  and the reliability score range 0.726 – 0.883.

## 7 DISCUSSION

The development design method using meaning structure is give an orientation, for human cognition into image preferention for a product approaching that meaning. Some study in Kansei Engineering use qualitative technique that orientate to the element design phenomenon. That consequence of the proces are subjectively have to made evaluation for the impact of repons from customers emotional. One of the contribution of the design method approaching meaning structure is involve the designer as the most important element in modeling the new design. However in data static analyze, this method have a shortage to translate some meaning as this study “classic” can not be define by using WordNet because of the characteristic word that carry an old nature from product specify.

## 8 CONCLUTION

This paper has demonstrated the use of meaning structure to transform into a product elements, could support the proces design by designer. This method representation that can help the designer or craftsmen to translated the customer need as long as the words are facillytated by WordNet.

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