

DESIGN OF SACHEL BAG FROM THE FIBERS OF PINEAPPLE LEAVES BY USING KANSEI ENGINEERING METHOD

Hartomo Soewardi¹, Riska Aminatun Zahroh², Hudaya³

Industrial Engineering, Faculty of Industrial Engineering Technology,
Islamic University of Indonesia
hartomo@uii.ac.id¹, riskaaminatun@gmail.com², hudaya@uii.ac.id³

ABSTRACT

The issue of global warming is getting heavily discussed by our societies. One of causes is biodegradable waste that not be managed properly. The utilization of waste leaves as a consumerism product is an efforts to reduce the negative impact. Satchel bag is one of various types favourite bag. Based on the preliminary study is more than 72.5% respondents use the satchel bag made from synthetic leather. Fiber of Pineapple leaves as raw material for natural is one of the raw materials than can be made into products economical, unique and environmentally friendly. The purpose of this research is to design a satchel bag that it is made from fiber of pineapple leaves to satisfy customer criteria. Kansei Engineering method is used to identify user's feelings and emotion and to translate it into the parameters of design. Validation test was performed to test the design the hypothesis of design at the significance of 5 %. The result of this research is an eco-friendly satchel bag design which meet user requirements

Keywords: Satchel bag, Pineapple leaves, Kansei Engineering, Design, Feelings

1. INTRODUCTION

Environmental protection efforts become intensified because of global warming. One of the causes of this issue is biodegradable waste that not be managed properly. The utilization of waste leaves as a consumerism product is an effort to reduce the negative impact. One of them is pineapple leaves.

Pineapple plants will usually be harvested for two to three times [k]. Furthermore, they are re-cultivated by new plants. Therefore, wastes leaves are potential to be used as a main material for consumer product development such as satchel bag [k]. It because of pineapple leaves contains 54.23% of cellulose fiber, 13.13% of moisture, 4.98% of ash, 5.91% of lignin and 1.1% of extractives (Penelitian Balai Penelitian dan Pengembangan Industri Deperindag Yogyakarta, 2009) [b].

Some products have been using pineapple fiber as the main raw material, for example Christmas tree, flowers series, miniature garden to all hangings and room partitions [e] and used to make batik [e]. In this study, fiber of pineapple leaves will be used to develop the satchel bag that is a kind of bag that generally have a long strap,

buckle detail as the clasp, and a handle on it [a].

Many products have been successfully designed using this concept, for example the design of the model development centre gypsum panels [h], mobile product design automation [d], engineering cover 3 kg LPG cylinder [f] and product design multi-tool [c]. The purpose of this research is to design a satchel bag that it is made from fiber of pineapple leaves to satisfy customer criteria.

2. THEORETICAL BACKGROUND

Nagamachi and Lokman (2010) mentions that Kansei Engineering is a kind of technology that translate the customer's feeling into design specifications [g]. Kansei engineering consist of 6 types namely type 1: Classification, type 2: Kansei Engineering System, type 3: Hybrid Kansei Engineering, type 4: Expert System of Kansei Engineering, type 5: Virtual Reality Kansei Engineering and type 6: Collaborative Kansei Engineering [g].

In this study using Kansei Engineering Type 1. Type I is a fundamental technique of the Kansei which uses the process-ruled

means to reach the final successful conclusion [g].

The process of kansei engineering type 1 has 5 steps. The first step is identification of target. The next step is to develop the product concept as can be seen in Figure 1 (Nagamachi and Lokman 2010):

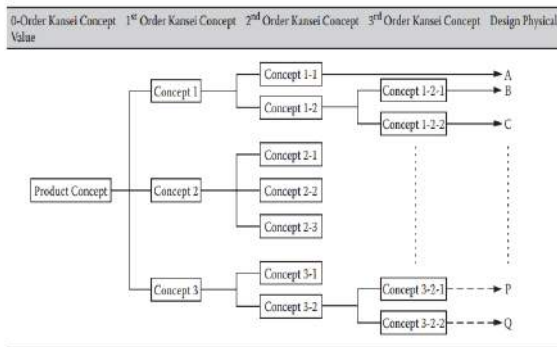


Figure 1. Conceptual Map of Kansei Engineering Method Type 1 [g]

Figure 1 also explains the third step that the product concept should be broken down into several levels to physical design. The fourth step is deployment to physical design characteristic more detail and easier to understand. The last step is translate to technical specification [g].

3. RESEARCH METHOD

3.1 Survey

Paper based survey was conducted in this study to identify customer attribute of satchel bag. The questionnaire was developed and deployed to 70 respondents. It consist of three parts, namely the identification of the customer, the physical design parameters and validation. Respondents are all users the satchel bag made from synthetic leather. Their ages ranged old 17-25 years old in the city of Yogyakarta.

3.2 Develop the Virtual and Real Prototyping

Once the mapping process and then create a virtual prototyping. The virtual prototype were based on the physical design of the mapping. Manufacturing of the virtual prototype designs using software SketchUp Pro version 8.0.4811.

3.3 Statistical Analysis

In this study was implemented non parametric statistical analysis. Cronbach Alpha was used to test reliability [j]. Spearman's Rank Correlation was employing to test the validity of Kansei words [i].

Descriptive non parametric statistical analysis was used to map the Kansei words to physical design characteristics. Stuart Maxwell test of Marginal homogeneity analysis was used to validate satchel bag [i].

4. RESULT AND DISCUSSION

4.1 Kansei Word

Table 1 present 6 kansei word that is valid and reliable. They are unique, forceful, secure, flexible, fashionable and simple.

Table 1. Kansei Word are Valid and Reliable

No.	Kansei Word
1.	Unique
2.	Flexible
3.	Simple
4.	Forceful
5.	Secure
6.	Fashionable

Unique indicate that users feel the satchel bag design different than others. Kansei word on 'flexible' means that user requires easily adjustable design of the satchel bag in a various of activities. Kansei word on 'simple' describes the feelings of user that the existing models of the satchel bag is not too many accessories and that design is efficient in use. Kansei word on 'forceful' illustrates the users feeling that material used is not easily damaged, broken and strong in use. Kansei word on 'secure' means that users feel the items in bag was protected. Kansei word on 'fashionable' describes the feeling of user that satchel bag model can support their appearance and performance.

4.2 Proposed Design of The Satchel Bag

After getting kansei words from test result of validation and reliability, the next step is break the kansei words into some design parameters. The result of the design can be seen in Table 2– 7 below:

Table 2. Kansei Word of Unique

Orde 0	Orde 1	Orde 2	Orde 3	Physical Design
Unique	The combination of materials	Using leather material	Type Position	Vegetal Leather Handbag straps, rope sling, hook bag.
		Using natural material	Type Position	Fiber of pineapple leaves Part of the body

Table 3. Kansei Word of Flexible

Orde 0	Orde 1	Orde 2	Orde 3	Physical Design
Flexible	Can be used for various activities	Rope Sling	Material Size	Vegetal Leather 130 cm x 1,5 cm
		Handbag Straps	Material Size	Vegetal Leather 23 cm x 1,5 cm
		Part of The Body	Material Size	Fiber of Pineapple Leaves 28 cm x 7,5 cm x 19 cm

Table 4. Kansei Word of Simple

Orde 0	Orde 1	Orde 2	Physical Design
Simple	Minimalist Color	Part of The body Handbag Straps Rope Sling Hook Bag	Wood Board Cork Maroon Maroon Maroon
	Space Minimalist Bag	Two parts	Part of the body and Pocket front bag
	Shape of The Bag		Box

Table 5. Kansei Word of Forceful

Orde 0	Orde 1	Orde 2	Physical Design
Forceful	Not easily damaged	The processing of pineapple leaf fibers into the raw material	Weaving techniques
		The outside of the bag	80 % of fiber of pineapple leaves, 20% vegetal leather
		The inside of the bag	Sponge and Suede Material
		Kind of Yarn	Nylon Yarn

Table 6. Kansei Word of Secure

Orde 0	Orde 1	Orde 2	Physical Design
Secure	Can protect the items inside the bag	Lock Cover Bag	Buckle model and magnets
		Position	The front of the bag (left and right)

Table 7. Kansei Word of Fashionable

Orde 0	Orde 1	Orde 2	Orde 3	Physical Design
Fashionable	Looks interesting	Accessories	Material Position	Buckle latch The left and right of the front of the bag
		Brand	Brand Name Material Position Size Font	AZED Vegetal Leather The front cover of the bag 5 cm x 1,5 cm Rockwell, pt : 45

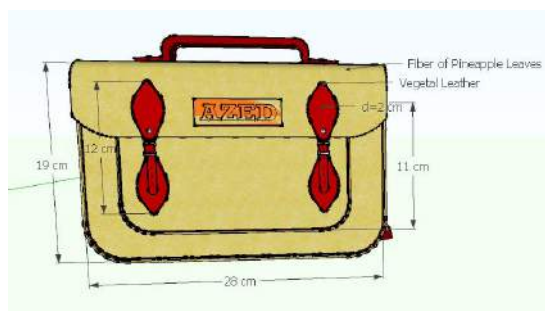


Figure 2. The Front Side of The Satchel Bag

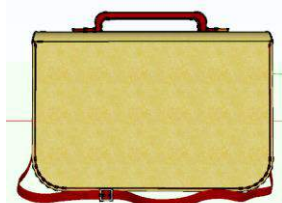


Figure 3. The Back Side of The Satchel Bag

4.3 Validating Fiber of Pineapple Leaves Satchel Bag

Stuart Maxwell test of marginal homogeneity conducted to validate the fiber of pineapple leaves satchel bag. This test on the hypothesis whether there are significant differences between user needs and design satchel bag from fiber of pineapple leaves. The hypothesis is developed as follows:

H0: there is no significant difference between the needs of users with the satchel bag design.

H1: There are significant differences between the needs of users with the satchel bag design.

Table 8. Stuart Maxwell Test of Marginal Homogeneity Results

User's Requirement	Z Values
Unique	0,376
Flexible	0,202
Simple	0,297
Forceful	0,148
Secure	0,094
Fashionable	0,104

This test was to compare between the results of prior survey and the latest result of survey. As shown in Table 8, the z values was ranged from 0.094 to 0.376. So the null hypothesis can be accepted at 5% of

significant level. This means that the satchel bag design satisfied user's requirements.

5. CONCLUSION

1. The customer criteria of satchel bag are unique, flexible, simple, forceful, secure, and fashionable.
2. Design satchel bag is valid to meet user criteria at 5% of significant level.

6. REFERENCES

- (a) Anjani, Siti Rahmi. 2014. <http://wolipop.detik.com/> Access date: 13 Oktober 2014 at 15.18.
- (b) Ariawan, Dody. 2009. Serat Nanas Sabrang-Potensi Bahan Baku Komposit dari Hutan Kulon Progo.
- (c) Indrawan, Lucky Septia. 2011. Aplikasi Metode Kansei Engineering Pada Produk Multitool. Yogyakarta: FTI UII
- (d) Kurniawan, Iwan. 2010. Otomatisasi Desain Menggunakan Konsep Kansei Engineering untuk Produk Handphone. Semarang : Universitas Diponegoro.
- (e) Liputan 6. 2014 Limbah Nanas Disulap Jadi Batik Luar Biasa <http://news.liputan6.com/>, Access date: 06 Desember 2014 at 10.21.
- (f) Murwibowo, Raden Edhityo. 2011. Rekayasa Cover Tabung dengan Menggunakan Metode Kansei Engineering untuk Memberi Kesan Aman pada Pengguna Tabung Elpiji 3 Kg. Yogyakarta: FTI UII
- (g) Nagamachi, Mitsuo and Lokman, Anitawati mohd. 2011 Innvoation of Kansei Engineering. Boca Raton, New York : CRC Press Taylor & Francis Group.
- (h) Prasetyo, Ardian Dwi. 2008. Pengembangan Perancangan Model Center Panel Gypsum dengan Metode Kansei Engineering.
- (i) Sheskin, David J. 2004 Handbook of Parametric and Non Parametric Statistical Procedures Third Edition. Washington : Chapman & Hall/CRC.
- (j) Vehkalahti, Kimmo and Puntanen, Simmo. 2006. Estimation of realibility: a better alternative for Cronbach's alpha. Departement Mathematics and Statistic University of Helshinki, Finland.

(k) Yahya, Nurr Hayaati. 2013. Serat Nanas Sebagai Bahan Tambahan (Admixture) Beton Ringan.

AUTHOR BIOGRAPHIES

Hartomo Soewardi is a senior lecturer of Industrial Engineering Department, Faculty of Industrial Technology, Islamic University of Indonesia, Yogyakarta, Indonesia. Currently he is Ph.D in Engineering Desain and Manufacture. His teaching and research interest are industrial ergonomic design, product design, management and quality

design. His email address is hartomo@uii.ac.id

Riska Aminatun Zahroh is a final student of Industrial Engineering Department, Faculty of Industrial Technology, Islamic University of Indonesia, Yogyakarta. Her email address is riskaaminatun@gmail.com

Hudaya is a senior lecture of Industrial Engineering, Faculty of Industrial Technology, Islamic University of Indonesia., Yogyakarta, Indonesia. hudaya@uii.ac.id