**PRELIMINARY STUDY OF THE IMPLEMENTATION OF KANSEI ENGINEERING METHOD FOR THE EARLY SUSTAINABLE DEVELOPMENT PROCESSED WALLET DESIGN BY USING BANANA MIDRIBS**

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***Abstract.*** *Efforts to protect the environment were useful to reduce waste of banana tree which can cause global warming from the burning waste of banana tree. One of the effort to reduce waste of banana tree was used the waste as wallet products’ material. In order for wallet products to be able to compete in the market, it was necessary to have the right design to be able to describe the desires of consumers. The purpose of this research was to design a wallet made from waste of banana tree which can fulfill the needs of wallet consumers in the process of sustainable development. Kansei Engineering was used as a method to translate consumer feelings. Validation tests and evaluation were conducted to examine the research hypothesis using a 5% significance level. Consumer desires in the form of Kansei words that were obtained were strong, durable, waterproof, attractive, simple, neat, has a string, smooth, lightweight, environmentally friendly and multifunctional. Among consumers' wishes (Kansei words), consumers wanted the Kansei words to be strong and environmentally friendly which was prioritized in wallet design. The results of this study were obtained midrib of banana tree wallets in accordance with the wishes of the wallet consumers with the criteria of strong, environmentally friendly and multifunctional, moreover attractive because it shows more the original fiber of the midrib`s banana tree.*

***Key Words*:** *Kansei Engineering*, *wallet*, *banana tree midrib*, *product design, sustainable development*

1. **Introduction**

Based on Sleman the department of Agriculture, Fisheries and Forestry (2013), the number of banana tree plants in Yogyakarta reaches 317,100 trees. Each banana tree will produce banana tree waste, namely midrib. As in Madura, the Madurese preserve large amounts of banana trees but they only use the fruit and leaves. While the midrib is left to be scattered garbage (Gustiaawati et al, 2011). By looking at the potential waste from the banana tree, there needs to be attention from the community which has a significant effect on reducing the banana tree waste. The community that understands this is doing an innovation to reduce banana tree waste, namely midrib. Along with the proliferation of various issues regarding environmentally friendly products and the demands of consumers for quality products, they encourage the awareness of various parties to start making friends with the environment (Prawitasari, 2011). This is related to the results of interviews with one of the handicraft producers, by processing banana midribs into an economically valuable product. The products made from banana fronds that have been produced by handicraft makers are carpets and baskets by twisting the banana midrib, so that the typical fibers of the banana midrib do not look. The results of this interview are in line with the research on the use of banana fiber as a textile craft material in the weaving and creative craft company of Pekalongan (Maimunah, 2006), that along with the increase in science and technology, much can be used from wastes that are rarely utilized by the community so will improve the quality of the waste and increase the economic value of the waste. With the global issue, a product that is made from materials that are environmentally friendly is needed. Environmentally friendly materials that can be used in making a product are natural fibers, because natural fibers are fibers made from natural ingredients. These materials are very easy to obtain and can decompose well so they can reduce environmental pollution (Nashikhah, 2012).

Besides being used by handicraft craftsmen, banana midribs are also used as a substitute for wood because the level of paper consumption in Indonesia is very high. The high level of paper consumption makes the trees which are the raw material for making paper decreases. If this problem continues, the trees in Indonesia will be exhausted and natural disasters will arise due to deforestation. Therefore, banana fronds are used as a substitute for wood, in order to reduce tree felling (Yunifath, 2012).

If the community can continue to use the banana stem waste, it will certainly be able to reduce the waste of banana midribs and reduce global warming due to the destruction of banana midrib waste by burning the banana midrib waste. from the banana midrib, which is the main attraction possessed by midrib. Based on the results of interviews with consumers, the most popular products are wallets, this product is in demand because the wallet has benefits as a place to save money when consumers travel. Therefore, the product to be examined in this study is a wallet.

The success of this product depends on consumers. The success of a product can be measured by how much the existence of the product can be accepted by consumers, and will directly increase profits for the company or producer and vice versa (Yuliarty, 2013). In this discussion, the form of feelings that consumers receive in using a particular product, will be an important aspect that needs to be studied more deeply in the initial process of product design. One method commonly used in product development to get a better understanding of emotions and their relevance to specific design characteristics, which can then be used to design products in communicating desirable feelings is the kansei engineering method (Green and Chattaraman, 2019). The involvement of feeling aspects in the initial design process will make the perception of subjectivity between consumers appear. However, Kansei Engineering is an ergonomic approach to product development or services that can translate consumers' subjective perceptions into design specifications (Yeh and Chen, 2018). This is a distinct advantage for the Kansei Engineering method compared to other similar methods. Kansei Engineering will help an appropriate framework in which data processing attributes and consumer perceptions are not determined by experts or researchers, but are expressed from the words or feelings of the consumers themselves (Castilla et al, 2018). Manufacturing production carried out in the future is expected to survive continuously accepted by consumers. This is supported by how the initial product design process, in this case the wallet, seeks to focus and be centrally oriented towards consumer feelings with the Kansei Engineering method (Vieira, 2017).

1. **Method**

The method of this research is kansei engineering. According to Nagamachi (1995), kansei engineering is a method for translating consumer emotional feelings into design components. According to Hartono (2012), the desire of consumers need begins to see and demand emotional satisfaction. The fulfill of consumer`s emotional needs is increasingly important to note, especially in developing industries. The consumer`s emotional needs are considered important to note because it can affect consumer loyalty (Hartono et al, 2013). Kansei value is imagination of consumer to product or service (Restantin et al, 2012).

There are steps on this research are:

1. Planning and Preparation

At this stage, the researcher makes a direct observation of consumer`s need from the banana midrib wallet. This observation was carried out by interviewing consumers and craftsmen to find out the needs and desires of consumers on banana midrib wallet products.

1. Survey about consumer needs

The researcher conducted a survey of consumer`s wallet to find out the needs and desires of kansei words for wallet products by interviewing and distributing open questionnaires to respondents.

1. Validity and reliability tests

Fromthe results of the collection kansei words, the kansei word wastested for validity and reliability test to find out whether or not the reliability of the questionnaire results had been obtained through the distribution of the questionnaire.

1. Survey to know the priority of kansei words (importance rating)

After kansei words are valid and reliable, then the next step is to distribute the questionnaire again to find out and calculate the importance of kansei words. Then the design is for medaccording to the level of importance of each kansei word.

1. **Result and Discussion**
* **Planning and Preparation**

The first step is to conduct literature studies and field observations. The literature studies related to this research is the study of product planning and development, the concept of kansei engineering and previous studies such as journals and final assignments related to the method. The field observation was carried out in order to find out the wallet design like what consumers want from wallet products. In research of data collection conducted questionnaires as many as 30 pieces on each questionnaire. There are 5 stages in distributing the questionnaire, namely the first questionnaire which contains 1 question about what respondents want in the banana midrib wallet.

The second questionnaire contains several questions about kansei words. The kansei words appropriate to the respondents' feelings for the design of banana midrib wallet. The third questionnaire contains several questions about consumer needs which are more important in designing a banana midrib wallet. The fourth questionnaire contains several questions to compare the design of the new banana midrib wallet with the old banana midrib design.

Aftermaking a banana midrib wallet prototype with new design, the banana midrib wallet will be tested with the old design for validity process. The validation test will be used the Marginal Homogeneity test. To find out the difference design, the fifth questionnaire will be distributed and then process design the Marginal Homogeneity test.

* **Kansei Engineering**

After conducting interviews and distributing questionnaires to 30 respondents, the results obtained were 18 kansei words. Kansei words are human psychological feelings. In this case, adjectives are expressed in words (Marlyana et al, 2012). Kansei words are multifunctional, durable, attractive, water resistant, neat, strong, environmentally friendly, large capacity, smooth, unique, lightweight, simple, trendy, small size, resettling cover, has straps, have several bulkheads, traditional. Kansei said that it was obtained then the validity test and reliability test would be carried out. Validity test is used to measure whether or not the results of the questionnaire are valid. The validity test of this study using SPSS 16.00 software, a significant level of 5%, the results of the SPSS 16.00 software must be above (n-1) 0.367. From the results of the validity test, which can be seen in table 1, it is seen that not all kansei words show significant results. For testing and work on the next stage the kansei words cannot be included.

**Table 1**.Validity Test Results

|  |  |  |  |
| --- | --- | --- | --- |
| Kansei Words | *r table* | *r hitung* | Status |
| Neat  | 0,367 | 0,589 | Valid |
| Solid | 0,367 | 0,544 | Valid |
| Lightweight | 0,367 | 0,520 | Valid |
| Simple | 0,367 | 0,514 | Valid |
| Smooth | 0,367 | 0,496 | Valid |
| Has Straps | 0,367 | 0,486 | Valid |
| Durable | 0,367 | 0,480 | Valid |
| Water Resistant | 0,367 | 0,468 | Valid |
| Multifunctional | 0,367 | 0,435 | Valid |
| Environmentally Friendly | 0,367 | 0,399 | Valid |
| Attractive | 0,367 | 0,367 | Valid |
| Trendy | 0,367 | 0,364 | Unvalid |
| Small Size | 0,367 | 0,289 | Unvalid |
| Large Capacity | 0,367 | 0,157 | Unvalid |
| Traditional | 0,367 | 0,097 | Unvalid |
| Resettling Cover  | 0,367 | 0,091 | Unvalid |
| Unique | 0,367 | 0,058 | Unvalid |
| Have Several Bulkheads | 0,367 | 0,034 | Unvalid |

Reliability tests are then carried out to see whether a questionnaire can be said to be reliable or not. This reliability test uses SPSS 16.00 software. The kansei word is said to be reliable if it gives Cronbach Alpha values > 0.70. Results from this reliability test can be seen in the table 2.

**Table 2**. Reliability Test Results

| Kansei Words | *r table* | *r hitung* | Status |
| --- | --- | --- | --- |
| Environmentally Friendly | 0,7 | 0,734 | *Reliable* |
| Attractive | 0,7 | 0,732 | *Reliable* |
| Multifunctional | 0,7 | 0,727 | *Reliable* |
| Water Resistant | 0,7 | 0,725 | *Reliable* |
| Smooth | 0,7 | 0,723 | *Reliable* |
| Durable | 0,7 | 0,722 | *Reliable* |
| Lightweight | 0,7 | 0,72 | *Reliable* |
| Strong | 0,7 | 0,72 | *Reliable* |
| Simple | 0,7 | 0,716 | *Reliable* |
| Has Straps | 0,7 | 0,716 | *Reliable* |
| Neat | 0,7 | 0,714 | *Reliable* |

1. **Conclusion**

Through the application of Kansei engineering, consumer's desire (kansei word) towards the initial process of sustainable development in the design of banana frond wallet products is strong, durable, water resistant, attractive, simple, neat, has straps, smooth, lightweight, environmentally friendly and multifunctional. The highest priority of consumer`s desire are strong and environmentally friendly. Therefore, the Kansai engineering process can be carried out to assist the stages of sustainable development in the initial design of the product.

**References**

Dinas Pertanian, Perikanan and Kehutanan Sleman. Pertanian, Perikanan dan Kehutanan. Available from: <http://www.slemankab.go.id/3271/pertanian-perikanan-dan-kehutanan.slm> [Accessed 6th November 2014].

Gustiaawati E, Fahrizal taufiq qurrachman, Qomariah NL. Pemanfaatan Sampah PAPPA Sebagai Bahan Dasar Alternatif Pembuatan Sandal dan Tas Khas Madura*.* Bangkalan: Universitas Trunojoyo Madura; 2011.

Hartono M, Suseno A, Surjani, Meitha Rosita. Aplikasi Integrasi Kansei Engineering dan Metode TRIZ Pada Layanan Villa Nunia, Bali. Surabaya: Teknik Industri Universitas Surabaya. 2013.

Hartono, Markus. Kerangka Konseptual Integrasi Servqual, Model Kano dan Kansei Engineering dengan QFD pada Industri Jasa. *Proceeding Industrial Engineering Conference* Peranan Teknologi dan Inovasi dalam Pembangunan Berkelanjutan ISBN 978-979-96854-4-5.2012; 33-1 – 33-7. Yogyakarta: UPN Veteran.

Maimunah N. Pemanfaatan serat pisang sebagai bahan kerajinan tekstil di perusahaan tenun dan kerajinan kreatif ridaka Pekalongan. Surakarta: FSSR Universitas Sebelas Maret. 2006.

Marlyana N, Nurwidiana, Taufiq AR. Penerapan Metode *Kansei Engineering* Dan Anthropometri Pada Pemilihan Desain Fasilitas Ruangan Warnet. ISBN: 978 – 602-097-305-0.2012: 1-9. Semarang: UNNISSULA.

Nagamachi M. *Kansei Engineering; the Implication and Applications to Product Development. Proceding of System, Man, and Cybernetic.* 1995.

Nashikhah M. Pengaruh Jarak Lungsin Terhadap Hasil Jadi Tas Dengan Teknik *Tapestry* Berbahan Agel. Surabaya: FT Universitas Negeri Surabaya. 2012.

Prawitasari RA. *Karya ilmiah peluang bisnis*. Yogyakarta: STIMIK AMIKOM. 2011.

Restatin YN, Ushada M, and Ainuri M. Desain Prototipe Meja dan Kursi Pantai Portabel dengan Integrasi Pendekatan Ergonomi. *Value Engineering* dan *Kansei Engineering*. ISSN 2087-7439.2012: 1-9.

Yunifath. Kertas Dari Batang Pohon Pisang, Metode “Emil Heuser”. Available from: <http://chemichemo,wordpress,com/2012/07/03/kertas-dari-batang-pohon-pisang-metode-emil-heuser-2/> [Accessed 6th November 2014].

Yuliarty P, Permana T, Pratama A. PASTI : Pengembangan Desain Produk Papan Tulis Dengan Metode *Quality Function Deployment* (QFD). ISSN 2085-5869. 2013: 1-13.

Green A, and Chattaraman V. Creating an Affective Design Typology for Basketball Shoes Using Kansei Engineering Methods. In: Fukuda S. (eds) Advances in Affective and Pleasurable Design. AHFE 2018. Advances in Intelligent Systems and Computing. 2019. vol 774. Springer. Cham.

Yeh CT, and Chen MC. Applying Kansei Engineering and data mining to design door-to-door delivery service, Computers & Industrial Engineering. 2018: 120. pp.401-417.

Castilla N, Llinares C, Bisegna F, and Blanca-Giménez V. Affective evaluation of the luminous environment in university classrooms. Journal of Environmental Psychology. 2018: 58. pp.52-62.

Vieira J, Osório JMA, Mouta S, Delgado P, Portinha A, Meireles JF, and Santos JA. Kansei engineering as a tool for the design of in-vehicle rubber keypads. Applied ergonomics. 2017: 61. pp.1-11.