



Integration of ergonomic and aesthetic factors in handbag product development

Dwi Cahyadi¹, and Ratna Wulaningrum^{2*}

¹ Department of Design, Politeknik Negeri Samarinda, Samarinda, Indonesia

² Department of Accounting, Politeknik Negeri Samarinda, Samarinda, Indonesia

*Corresponding author's email: ratna@polnes.ac.id

Abstract

This study aims to design a rattan handbag product using the ergo-aesthetic model and ISO 9001 guidelines in the design process. Previous studies have often examined ergonomic and aesthetic aspects separately, while limited research has combined both through a quality guided procedure in rattan handicraft design. Therefore, this research applies an integrated approach to improve functional and visual product quality. The study employed a product design methodology consisting of three stages: preliminary design, design development, and final prototyping. The prototype was evaluated through a user preference survey involving 60 respondents using a Likert scale with five response options. Data were analyzed using a binomial test to determine significant differences between the prototype and existing products. The findings indicate that the prototype is preferred in terms of motif, color selection, and material combination, while no significant differences were found in form and handle attributes. These results suggest that visual aesthetic factors play a dominant role in user preference. This study demonstrates the integrated application of the ergo-esthetic model and ISO 9001 procedures in rattan handbag development.

Keywords

Ergonomic, Aesthetic, ISO 9001, Handbag

Introduction

Handicraft products are creative works associated with the processes of creation, production, and distribution carried out by artisans [1]. These products encompass a wide range of items made from materials such as natural fibers, leather, rattan, wood, glass, fabric, marble, clay, chalk, and metal. Owing to this material diversity, handicraft products serve not only utilitarian purposes but also embody significant cultural, social, and economic values. In Indonesia, handicraft products demonstrate strong historical and aesthetic values that have long sustained their market appeal [2]. Aesthetic value is closely linked to visual attractiveness and the philosophical meanings embedded in handicraft products [3], and is commonly expressed through product appearance and

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form, including color, motifs, and material selection [4–6]. These studies primarily emphasize the visual and emotional dimensions of product evaluation.

Beyond aesthetic considerations, ergonomics has also been recognized as a critical factor in handicraft product design, ensuring safety, comfort, and alignment with user [7]. Ergonomic studies focus on optimizing human and product interaction to improve comfort and reduce physical strain during use [8]. However, investigations in bag design often concentrate either on anthropometric suitability or specific ergonomic adjustments without explicitly integrating aesthetic evaluation within a structured development framework [9,11]. This separation indicates that ergonomic and aesthetic aspects, although acknowledged as important, are frequently examined independently. Product quality development has been explored through the application of the ergo-aesthetic model, which integrates ergonomic and aesthetic considerations simultaneously in product design [10–12]. In parallel, ISO 9001 functions as an internationally recognized quality management guideline applicable to structured product development processes [13]. Although both approaches provide systematic perspectives, their combined application in handicraft product design, particularly in rattan handbag development, has not been clearly articulated in prior studies. As handicraft products, rattan bags also play a strategic role in improving community welfare through small and medium enterprises supported by both government and private sectors. The Indonesian National Industrial Development Master Plan (RIPIN) 2015–2035 emphasizes enhancing the competitiveness and quality of rattan handicraft products as a national priority [14,15].

In line with this agenda, the Indonesian Furniture and Handicraft Industry Association supports industry strengthening through raw material provision and rattan handicraft development programs [16]. The export potential of rattan handicrafts contributes significantly to job creation and income generation [17–19], and research indicates that handicraft industry development enhances community welfare when supported by policy interventions [20]. Globally, handicraft products also contribute to tourism development and local economic sustainability [21–23]. Demand for handicraft products spans various age groups and genders, with interest among younger consumers increasing from 17% in 2006 to 32% in 2020 [24]. This trend encourages the development of designs aligned with modern lifestyles and evolving consumer expectations [25]. In this context, ergonomics and aesthetics emerge as fundamental components of rattan bag design. The application of ergo-aesthetic principles emphasizes user behavior and cultural context to enhance product quality [26,27]. The integration of these aspects has increasingly become a focus in contemporary product design research, aiming to bridge factors previously examined separately and to support the development of competitive and sustainable handicraft bag products [28–30].

Previous studies have recognized ergonomic and aesthetic factors as important in handicraft product design. However, in rattan handbag development, these aspects are often treated separately rather than integrated within a structured design process.

Furthermore, the systematic integration of ergonomic and aesthetic principles within ISO 9001 guided design stages remains insufficiently articulated in rattan handbag development. This research represents a structured integration of ergonomic and aesthetic principles within ISO 9001 design procedures, which has not been explicitly articulated in prior rattan handbag design studies. This study contributes to research driven innovation in the rattan industry by developing a systematically designed rattan handbag that integrates ergonomic and aesthetic principles within ISO 9001 guided design stages, while supporting the strategic direction of the Indonesian National Industrial Development Master Plan 2015–2035 for the development of innovative rattan products.

Method

This research adopts a structured product design and development methodology that is widely applied in product design studies. The process consists of three main stages, namely preliminary design (the initial initiation stage of design and determination of problems and design objectives), design development (the process of developing product design) and final design and prototype (the process of making, finalizing products and evaluation). Each stage is carried out in accordance with ISO 9001 guidelines to ensure systematic planning, controlled implementation, and quality oriented evaluation throughout the design process.

Preliminary design

This stage is the initiation of the research, beginning with a clear research problem and objectives. This initial stage also includes a literature review of previous research. This was done to better understand the concepts and theories related to and supporting this research. The research identified has identified the direction and objectives to be achieved, namely the design of a rattan bag product using the ergo-aesthetic model and ISO 9001. The product design is directed according to the concepts of the ergo-aesthetic model. The design of the rattan handbag must be adapted to ergonomic and aesthetic aspects, such as size, shape, color, motif, and materials used in the design.

Design development

This stage is a critical step in the design and development of the handbag product. This stage begins with product design through product design analyses. The analysis in this research product design is based on the use of an ergo-aesthetic model, including analysis of user needs and activities, the market, color, shape, anthropometry, materials, and other technical aspects. These analyses provide guidance for designing the handbag product, from initial sketches to the final design. The handbag is designed by generating several alternative designs, ultimately selecting one. This final design is then followed by the creation of a 3D model using computer graphics before being developed into a prototype. All stages in this section adhere to ISO 9001 standards to maintain a high-quality design process.

Final design and prototyping

After the prototype product was developed, field research was conducted to compare the prototype with existing products on the market and to evaluate user feedback through a questionnaire. The survey was conducted online and distributed to users in Indonesia who were familiar with rattan handbag products.

Respondents were required to be at least 15 years old and to have experience using handbags as well as knowledge related to rattan bag products. The product comparison was presented through standardized images and product descriptions to ensure consistent evaluation conditions among respondents. Data were collected over a specified period to obtain valid responses. The collected data were analyzed using the statistical procedures described in the analysis section. Existing products on the market were previously designed by the design team and compared with the new prototype to determine the level of market acceptance of the new product. This evaluation, which adheres to ISO 9001 guidelines, aims to identify ergonomic and aesthetic factors of interest to users. The results of this questionnaire evaluation provide important insights for research into product design based on an ergonomic-aesthetic model to enhance innovation in rattan handbags.

Results

In this study, the ergo-aesthetic model was applied to integrate ergonomic comfort and aesthetic considerations throughout the product design process, while ISO 9001 guidelines were used to ensure a systematic and structured workflow from concept development to final evaluation. The preliminary design stage served as a critical phase for translating user needs into a clear and measurable bag design by defining its structure, dimensions, form, and key functions. This stage also enabled early feasibility assessment, comparison of design alternatives, and identification of potential risks before proceeding to detailed design.

Target market analysis

The target market consists of female users aged 15 years and above in Indonesia with a modern lifestyle fashion orientation.

Ergonomic analysis

Ergonomic factor analysis includes safety and comfort based on size, shape, materials, and usage, with emphasis on adjustable, soft, and wide shoulder straps to reduce shoulder and neck strain.

1. **Weight Distribution:** balanced load distribution achieved through well-organized compartments to minimize stress on the shoulders and back.
2. **Materials:** Use of lightweight, strong, and breathable materials (leather and rattan) to reduce bag weight and enhance user comfort.
3. **Bag Design, Accessibility and Functionality:** Proportional bag shape aligned with user posture, featuring accessible openings for ease of use and use multiple

compartments designed for easy access to frequently used items without unpacking the entire bag.

Aesthetic analysis

Aesthetics factors are not only related to visual beauty, but also affect the user's perception of the product's quality, identity, and emotional value.

1. Bag shape: affects visual perception and ergonomics, proportional and harmonious forms enhance attractiveness and user identity.
2. Proportions: balanced proportions between compartments, straps, and ornaments create visual harmony and improve comfort and aesthetics.
3. Color: color selection shapes mood, brand identity, and product appeal through harmonious, contextual, and psychologically appropriate combinations.
4. Material: material texture adds visual and tactile value, influencing perceived quality and overall user experience.
5. Details and Ornaments: Well executed details and ornaments enhance craftsmanship, product identity, and aesthetic value.

The second stage is design development. It is the stage where an approved initial concept is further refined into a detailed design ready for production. In this study, bag design development is based on an ergo-aesthetic analysis from the previous stage, resulting in design guidelines for rattan handbags, ranging from rough sketches to final design alternatives. Several design alternatives are developed and evaluated based on functional, aesthetic, and market criteria, after which the selected design is advanced to technical development, including 3D modelling and mock-up preparation prior to prototyping. All stages follow ISO 9001 procedures to ensure a controlled and high-quality design process. The design process begins with exploratory sketches to visualize form, components, and functionality, leading to alternative designs, selection of the most suitable concept, and final design refinement ready for production (Figure 1).



Figure 1. Rattan handbag product design development process.

The last stage is final design and prototyping. It is a crucial stage in the product design process where the designs that have been refined and selected during the previous stage, are finally prepared for production. This process includes creating a model or prototype of the final design to test the functionality, aesthetics, and quality of the product before it is launched to the market. This stage ensures that the design not only meets the set aesthetic, ergonomic, and functional criteria but is also ready for efficient mass production.

Discussion

Product design specifications of rattan handbag prototype designed using a combination of dark brown leather for the main body and straps, woven rattan on the front and back panels for a natural and elegant appearance, and metal components as structural reinforcement and strap connectors. The bag has a box-shaped form with a slightly curved top, measuring 19.5 cm × 7.5 cm × 15.5 cm, with a material thickness of 1 cm and a maximum adjustable strap length of 80 cm. It features a lockable flap opening with a metal hook, two main compartments for essential items, and one smaller compartment for compact objects. A top handle made of wood or leather (12 cm length, 5 cm height) provides additional carrying options. Design details include polished leather finishes, hexagonal rattan weaving inspired by traditional motifs, and silver metal accessories that blend traditional and modern aesthetics. Functionally, the bag offers easy access, durability, and weather resistance, with a dark brown and beige color scheme complemented by lighter leather accents and natural with toned motifs. After the prototype was completed, the next stage involved conducting field research as a final product evaluation by distributing questionnaires to industry and users. The questionnaire was designed to compare the prototype with an existing product previously developed by the research team, with the objective of assessing market acceptance of the prototype as a new product. Figure 2 illustrates the comparison between the existing market product and the proposed prototype.



Figure 2. Comparison between product 1 (prototype) and product 2 (existing product developed in a previous study).

This evaluation aimed to assess the aesthetic and ergonomic factors of interest to 60 respondents. This evaluation provides important insights for research, contributing to the Indonesian rattan handbag industry, and identifying factors that need to be considered in improving current bag product innovation. The evaluated aspects in this study included pattern, color, material combination, bag shape, handle shape, handle material, and material texture or roughness.

The respondents were selected purposively based on the identified target market characteristics, namely users aged fifteen years and above with an interest in fashion oriented products. Data were collected using a structured questionnaire employing a five-point Likert scale to measure preference for each evaluated attribute. Responses were analyzed using a binomial test to determine whether significant differences

existed between the prototype and the existing product. This procedure ensured objective statistical validation of user preferences.

A binomial test was used to determine whether there was a significant difference in preference between product 1 and product 2. The null hypothesis (H_0) stated that there was no difference in preference, while the alternative hypothesis (H_1) stated that there was a difference. Based on the binomial test results, three attributes showed significant differences in preference ($p < 0.05$) are pattern, color, and material combination. These results indicate that respondents statistically preferred product 1 for all three characteristics. These findings indicate that visual aesthetics, such as the pattern's appearance, color selection, and the appropriate combination of materials used in product 1, were the primary attractions for respondents, leading to its greater preference over Product 2.

Meanwhile, the attributes of bag shape, handle shape, and handle material did not show significant differences in preference ($p\text{-value} \geq 0.05$). This indicates that both products were considered relatively equivalent in terms of physical shape and handle components, so respondents did not have a strong preference for one product or the other. These findings indicate that shape does not appear to be a primary determinant for respondents in distinguishing or determining product preferences. In contrast to the results above, the attribute of roughness showed that respondents significantly preferred product 2 ($p < 0.05$). This indicates that respondents perceived the material texture of Product 2 as softer and more comfortable. Although Product 1 excels in visual aesthetics, Product 2 demonstrates an advantage in material comfort, which is directly experienced by users.

Overall, it can be concluded that product 1 is superior to product 2, especially in terms of pattern quality, color selection, and the suitability of the material combination used. These considerations indicate that visual aspects are the dominant factor in respondents' assessments of bag products. These findings are aligned with previous research emphasizing the importance of visual attributes in shaping consumer preference in handicraft products. The significant preference for pattern, color, and material combination reinforces earlier arguments that visual qualities play a central role in the evaluation of handicraft fashion products. Earlier studies have demonstrated that motif articulation, color harmony, and material selection contribute significantly to perceived product value, and the present results confirm these observations within the context of rattan handbag design. At the same time, the absence of significant differences in bag and handle shape suggests that ergonomic attributes may operate more as fundamental requirements for usability rather than as decisive factors in product differentiation. The preference for softer texture in the comparison product further indicates that tactile comfort remains relevant in user perception, complementing visual appeal rather than replacing it. These findings highlight that while visual aesthetics dominate consumer evaluation, ergonomic comfort still contributes to overall product acceptance. Therefore, the integration of the ergo-aesthetic model with

ISO 9001-based design procedures remains essential to achieve balanced optimization between aesthetic appeal, ergonomic comfort, and consistent product quality.

Conclusion

This study aimed to design a rattan handbag product by applying the ergo-aesthetic model and ISO 9001 guidelines within a structured product design and development process. The research contributes to the Indonesian National Industrial Development Master Plan 2015–2035 by supporting innovation and research-based development of rattan products. The design process was conducted through three main stages: preliminary design, design development, and final design and prototyping. Based on the final evaluation involving 60 respondents, the results indicate that product 1 (Prototype) is superior to product 2 (Existing Product), particularly in terms of pattern, color selection, and material combination. These findings confirm that visual aesthetics play a dominant role in consumer preference for rattan handbag products. However, the evaluation also highlights the importance of ergonomic comfort, indicating that future product development should integrate both aesthetic appeal and material comfort to enhance competitiveness in the Indonesian rattan bag industry. In addition to its relevance to national industrial development, this study contributes to the field of product design by demonstrating the integrated application of ergonomic and aesthetic considerations within ISO 9001 guided design procedures. The findings provide practical insight into how ergonomic comfort and visual attributes can be systematically incorporated into rattan handbag development through a structured design and evaluation process.

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