# Bioresources and Environment

# Consumer's Perceptions and Buying Intentions for Furniture Made from Recycled Wood Slabs

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**ABSTRACT.** The rising cost of raw materials has redirected the furniture industry's focus towards innovation and sustainability, emphasizing wood waste as a promising resource for furniture production. Activities such as sawmilling, wood machining, and furniture manufacturing generate wood waste, including slabs, offcuts, and shavings, which can reduce profit margins. Recycling this waste explores innovative methods to add value and minimize waste. Despite the growing interest in wood waste as potential furniture material, there is limited data on the acceptance of furniture made from it. This study aimed to analyze consumer perceptions and buy intentions for a coffee table made from recycled wood slabs. Wood slabs were chosen as the primary material due to their availability and aesthetic appeal, which can bring uniqueness to the product. After successfully developing the product, a closed-ended questionnaire survey was conducted with 100 randomly selected respondents from diverse demographic backgrounds (including gender, age, and monthly income). The survey aimed to collect feedback on product attributes such as material suitability, design preferences, and buying intentions using a five-point Likert scale. Findings revealed that the durability, unique appearance of the recycled wood slabs, and its environmental benefits influenced most consumers' preferences and buying interest, indicating a positive reception of this product among potential consumers. All respondents expressed satisfaction with the product's attributes, with a mean rating above 4.0 indicating agreement. Respondents aged 31 to 40 show the highest interest (mean rating 4.5 and above) in the product attributes that demonstrate acceptance of recycled wood slabs as a potential material for furniture production. It can be concluded that this product holds high commercial potential in the current furniture market.

*Key words: Coffee table, Wood waste, Recycling, Consumer's perceptions, Buying intention*

## INTRODUCTION

The furniture industry, an integral part of human life, serves various purposes from sitting to decorating and significantly influences daily activities and the living environment. Traditionally, furniture is made from diverse raw materials including solid wood, wood composites, plastic, and metal, each providing unique design and functional features (Rachel, 2023). The world furniture market is developing dynamically and has undergone significant transformations over the last decade (Koridze, 2022). The Malaysian furniture industry is considered the country's fastest-growing sub-sector within the wood-based industry. It has grown from humble cottage-based beginnings to a multi-billion-dollar export-orientated industry over the last three decades (Ratnasingam et al., 2017a). Malaysia's furniture business is a significant socioeconomic sector in the country's resource-based economy. About 85 percent of the total production produced by the Malaysian furniture industry has been exported to foreign countries such as Japan, Europe, Singapore, the Middle East, and Australia (Ratnasingam et al., 2020).

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Among the resources available in furniture industries, wood is the predominant raw material due to its versatility and excellent properties (Ratnasingam, 2017b). The local wood resources come from both natural and plantation forests. It is also an eco-friendly material that is durable, safe, and beneficial for the user's health (Smardzewski, 2015). However, the supply of wood is not sustainable (Ratnasingam, 2017a). The government's efforts to conserve the forest environment and ecosystem by implementing the Sustainable Forest Management (SFM) system have resulted in a steady decline in logging activities, which directly affects the surplus supply of raw materials from natural forests (Ratnasingam, 2017b). In recent years, many researchers have also focused on recycling and reprocessing wood waste to make full use of and realize value-added products (Yang, 2021). Recycling wood waste from processing and production is not only innovative but essential. Each 1,000 board feet of sawmill manufacturing typically generates about 1,800 pounds of waste, comprising sawdust, shavings, and edgings (Saal et al., 2019). Of this material, roughly 75% is wood content, while the remaining 25% consists of bark. Given the high wood content in this waste, utilizing it effectively reduces disposal costs and environmental impact, reaffirming the importance of adopting recycled materials in furniture making.

Consumer choices play a crucial role in promoting a circular economy by choosing sustainable products (Calvo-Porral & Lévy-Mangin, 2020). The decision-making process in purchasing sustainable furniture is influenced by various attributes including understanding of environmental impact, material used, and design considerations (Williams, 2002). Household furniture which are usually offered in various shapes, sizes, style, colours and materials sometimes makes purchase decision- making overwhelmingly difficult for them (Oh et al. 2004). Besides, furniture products also have been evolving for centuries, providing not only practical or functional services, but also aesthetic benefits and environmental opportunities (Matthew, 2020). Moreover, individuals require significant time and effort to gather information and assess the products (Shukri et.al., 2013). Understanding consumer desires is considered the cornerstone for successful marketing and reliable production management of a product (Andreja et.al., 2021).
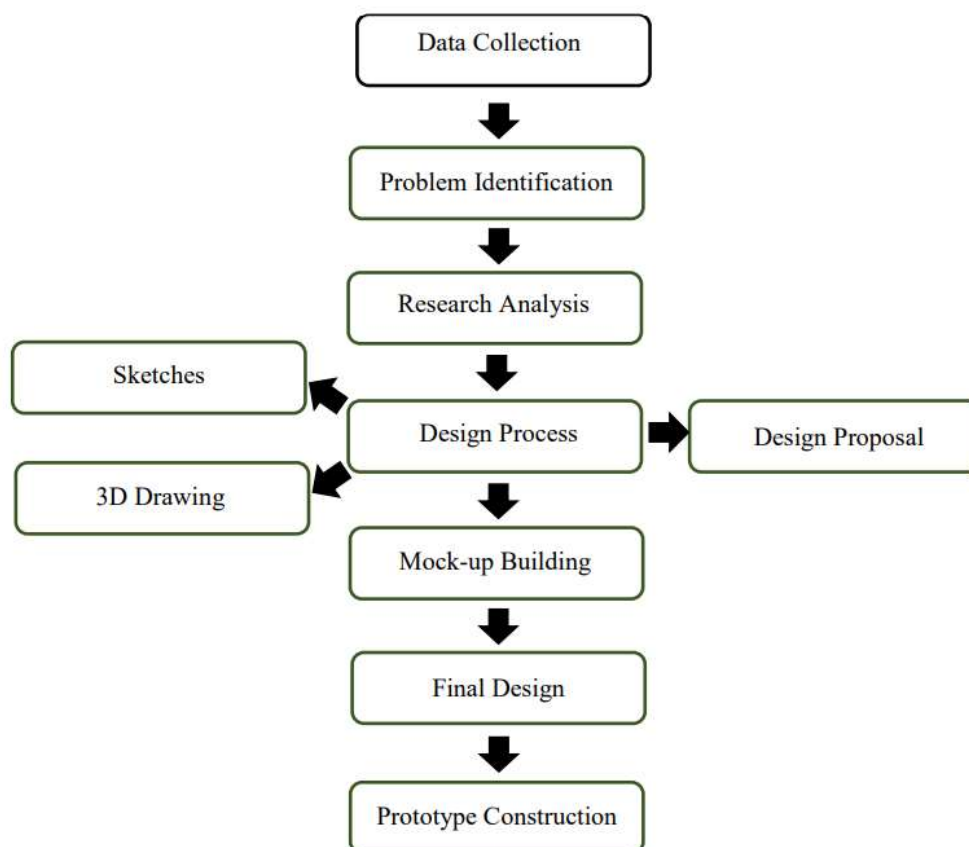
This study aims to delve into consumer perceptions and buying intentions regarding indoor furniture made from recycled wood slabs. By employing a survey methodology involving 100 potential customers and focusing on *Casuarina* spp. wood slabs, the research seeks to uncover insights into how demographic factors influence these perceptions and intentions.

## METHODOLOGY

### Product Design Process

The product design process involves several stages, each crucial to creating functional, ergonomic, aesthetically pleasing, and market-ready products. In this study, the product design process started with collection of data about raw materials for furniture manufacturing activities that was gathered through several searching approaches such as library resources, online database and pop-up survey. Then, all the data collected was analyzed, revealing a high

demand for wood sources coupled with surplus supplies for furniture manufacturing. Wood slabs have been proposed as a potential material for furniture production due to their availability and good properties. Indirectly, this can enhance the value of waste materials typically discarded. After that, the wood slabs are combined with expanded metal to achieve a modern and rustic look. Figure 1 visually presents the whole design process flowchart for a coffee table that was conducted at Wood Industry Workshop, Universiti Teknologi MARA (UiTM) Pahang Branch.



**Figure 1.** A flowchart of product design process

**Manufacturing Process**

The prototype manufacturing process is as outlined in Figure 2, which begins with the preparation of raw materials and ends with the finishing process.

**i) Preparation of raw materials:**

This study selected wood slabs from *Casuarina* spp. as the primary raw material. These slabs were sourced from sawmilling and wood machining waste from the Wood Industry Workshop, UiTM Pahang Branch. The moisture content of the slabs ranged from 12% to 15% after undergoing the oven drying process at 80°C. This study used wood slabs to produce both the tabletop and the right table leg parts. Then, expanded metal was combined with these slabs to produce the table rails and left table leg parts. They were customized from an outside metal factory at Jengka, Pahang.
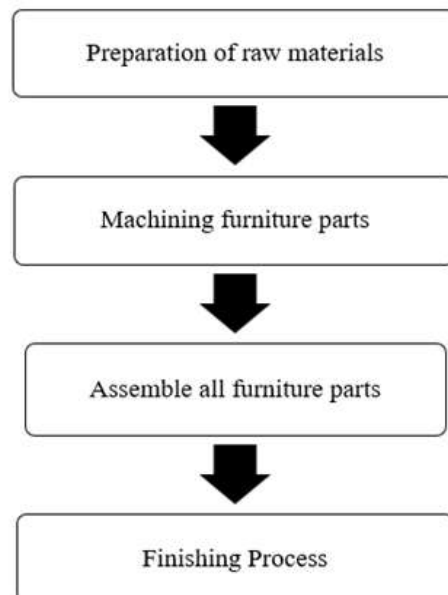
## ii) Machining furniture parts:

Various types of machinery were selected based on their specific functions to produce the required furniture parts. Ensuring that each part is accurately produced to the correct size and shape is crucial. This approach helps prevent assembly failures caused by incorrect or imprecise component dimensions. In this study, the process began with sawing using a band saw to remove the excess bark. The next step involved using a chainsaw to cut the slabs to the required length and a hand jointer to achieve uniform surfaces. The slabs were then processed through a thicknesser machine to attain the desired thickness. Once this was achieved, the slabs were edge-jointed by applying polyvinyl acetate (PVAc) adhesive and clamping them for 24 hours. Lastly, the edge-jointed slabs were used to produce the tabletop and the right table leg.

## iii) Assemble all furniture parts:

All the furniture parts were assembled using nails, wood screws and L-brackets.

## iv) Finishing process:

The tabletop and right leg parts were initially sanded with coarse sandpaper (grits 120 - 240) to smooth out the rough surfaces. After achieving a smooth finish, the first coat was applied and allowed to dry completely within two hours. Once the first coat was dry, a second sanding was performed with super fine sandpaper (grits 320 - 440) to polish the surface. The sanding dust was then wiped off with a clean cloth before applying the second coat. Both coats were applied using a spray gun.



**Figure 2**. Manufacturing flowchart of prototype

**Prototype Evaluation Using Questionnaire Survey**

This study used a random sampling method to recruit respondents who are employed and earn an income. A set of questionnaire surveys was designed and distributed to them using Google Form. The respondents were asked to rate the influence of various attributes on their acceptance and buying intention of coffee table made from wood slabs using a 5-point Likert scale, where 1 = strongly disagree and 5 = strongly agree. This scale is used to measure a respondent's perception or opinion. The survey also collected demographic data, such as gender, age range, and monthly income. The data on the relationship between demographic information and perceptions of product attributes was analysed and presented using the Social Science Statistical Package (SPSS) software, which employs reliability analysis (Cronbach's alpha test) as well as demographic and descriptive analysis.A sample of 100 respondents was successfully recruited for the study, with about 40% of them being male respondents and the majority being under the age of 40. Over half of the respondents earned a monthly income of less than RM4,000.

**Final Prototype (Product)**

The final prototype product of a coffee table made from *Casuarina* spp. wood slabs are as atatched in Figure 3 and Figure 4.



**Figure 3.** The final prototype product of a coffee table made from *Casuarina* spp. wood slabs



**Figure 4**. The aesthetic and uniqueness features of *Casuarina* spp. wood slabs at the table top part.

**RESULTS AND DISCUSSION**

**Demographic Analysis of Respondents**

The analysis focusses on the distribution of gender, age, and monthly income variables as detailed in Table 1. The sample consists of 100 respondents, with a gender distribution of 36% male and 64% female, indicating a higher representation of females in the study. The largest age factor group is between 21 and 30 years old, comprising 44% of the respondents. The second largest group is individuals aged 31 to 40 years, making up 31%, while those aged 41 years and above represent 25% of the respondents. This age distribution suggests a relatively younger population in the study. The study categorizes monthly income levels into four groups. Most respondents earn below RM2500, accounting for 32% of the respondents, followed by 30% of respondents who earned between RM2501 and RM4000. Individuals with an income between RM4001 and RM7000 represent 27%, and the smallest group, earning above RM7001, constitutes only 11%. This income distribution reflects a diverse economic background among the respondents.

Table 1. Demographic characteristics of respondents

| Demographic Variables | | Frequency (N) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 36 | 36 |
| | Female | 64 | 64 |
| | **Total** | **100** | **100** |
| **Age** | 21 - 30 years old | 44 | 44 |
| | 31 - 40 years old | 31 | 31 |
| | 41 years old and above | 25 | 25 |
| | **Total** | **100** | **100** |
| **Monthly Income** | Below RM2500 | 32 | 32 |
| | RM2501 - RM4000 | 30 | 30 |
| | RM4001 - RM7000 | 27 | 27 |
| | Above RM7001 | 11 | 11 |
| | **Total** | **100** | **100** |

**Reliability Analysis of Survey Data**

The consistency and predictability of an evaluation output determines its reliability (Phelan, 2019). In this analysis, the Cronbach's alpha ranges from 0 to 1, where the value greater than 0.7 is considered acceptable (Howard, 2024). Table 2 presents the study's reliability analysis. Cronbach's alpha value of material, design, and buying intention attributes were analyzed. The results show that all Cronbach's alpha values are above 0.7, which demonstrates that all data collected for these three attributes in this study are acceptable and consistent. This suggests that the items within each scale are highly correlated and effectively measure their respective constructs.
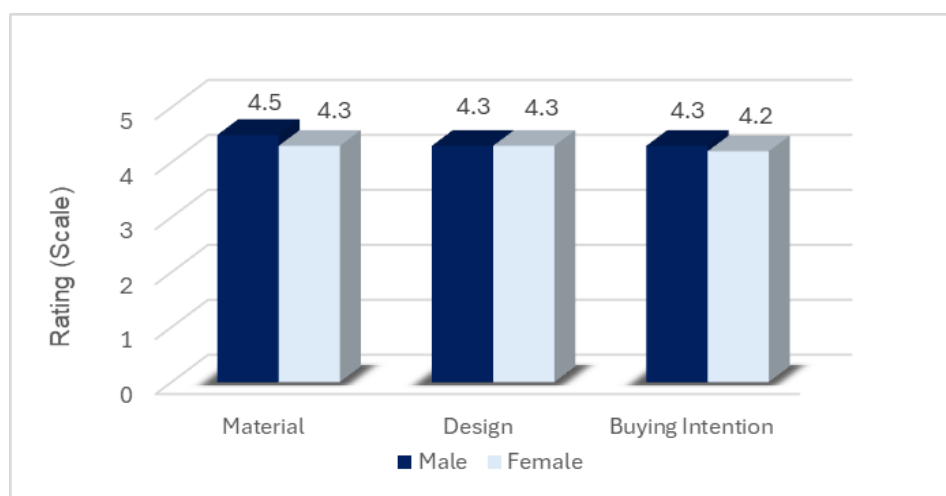
**Table 2**. Reliability analysis

| Cronbach's Alpha Based on Standardized Items | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of items |
|---|---|---|---|
| **Material** | 0.808 | 0.812 | 4 |
| **Design** | 0.807 | 0.807 | 3 |
| **Buying Intention** | 0.880 | 0.882 | 2 |

*\*If α ≥ 0.7, the data is acceptable*

**The Influence of Demographic Variables on Consumer Perceptions and Buying Intentions**

**i) Gender**

Figure 3 summarized the comparative analysis for both male and female respondents on product attributes, including material, design, and buying intention. A Likert scale of 1 to 5 (with 1 representing strong disagreement and 5 representing strong agreement) is applied. The data indicates that both genders have relatively similar perceptions, with slight variations. The mean rating of the three attributes is above 4, which means that they are highly agreed with them. Males rated the quality of wood slabs as raw material higher at 4.5, compared to 4.3 from females, suggesting that men have a slightly stronger agreement with the quality and suitability of the material. An equal rating was given to the design selection attribute (4.3), indicating a mutual appreciation of the product's design that applies modern and rustic concepts. In terms of buying intention, males rated it at 4.3, while females gave a slightly lower rating of 4.2, pointing to a small difference in their intention to buy the product. These findings are relevant as males often prioritize functional and performance-related aspects, such as material quality. Overall, both genders appreciated the use of recycled materials (wood slabs) in the furniture industry as it is aligned with the notion that environmental consciousness and sustainability have become one of the main concerns in buying furniture.
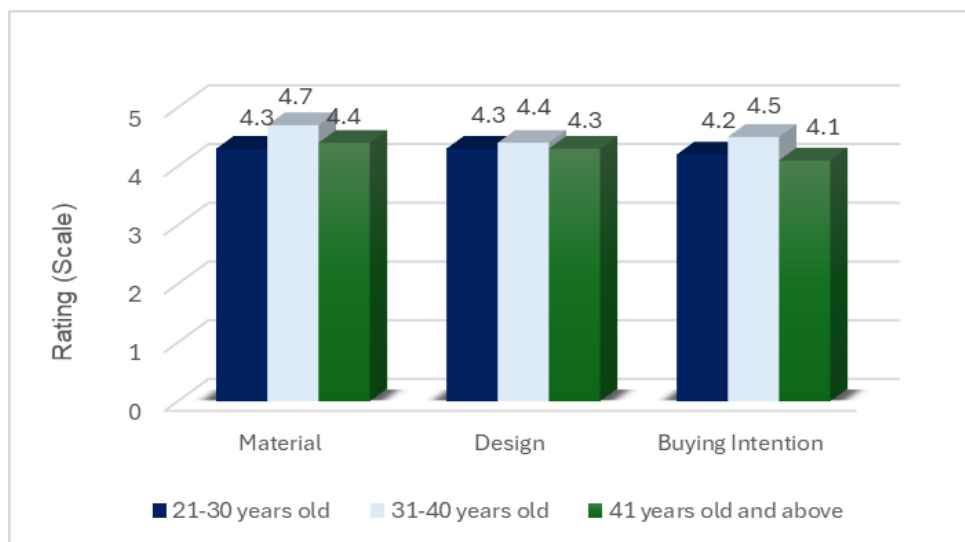


*\* Rating 1 to 5 (with 1 representing strong disagreement and 5 representing strong agreement)*

**Figure 3.** Mean rating of product attributes based on gender variable

## ii) Age

The age variable also impacted on the respondents' mean rating of the product attributes, as shown in Figure 4. For the youngest group of respondents, the ratings given are slightly similar, with values of 4.3, 4.3, and 4.2, respectively, for all three attributes (material, design and buying intention). This demonstrates that material quality acceptance and product design selection have a direct impact on consumer's buying intentions. Yan et al. (2017) stated that younger consumers tend to value both the functional and aesthetic aspects of a product, which explains the ratings across these factors. They are also more likely to prioritize innovation and style, influencing their overall satisfaction and perceived value of products. Furthermore, the respondents aged 31–40 show high interest in the material attribute, with a mean rating of 4.7, which shows their interest in the application of wood slabs as the main raw material for the product. This shift indicates that as consumers enter their 30s, they place more importance on the durability and quality of materials, thereby appreciating recycled materials for furniture production. Additionally, they also expressed strong agreement with the design attribute that prioritizes functionality and are more likely to value the craftsmanship of furniture made from recycled materials, enhancing their overall satisfaction with the product attributes (Gleim et al., 2013). In contrast, the 41-year-old and above respondents present a slight decline for all three attributes, with material rated at 4.4, design at 4.3, and buying intention at 4.1. This scenario shows that product familiarity (previous experiences in buying and using furniture) and price might start playing a more significant role in their buying intentions. Furthermore, a study by Hsu et al. (2016) indicates that while older respondents recognize the value of eco-friendly materials, they may require more convincing regarding the practical advantages and quality assurance of recycled wood furniture.
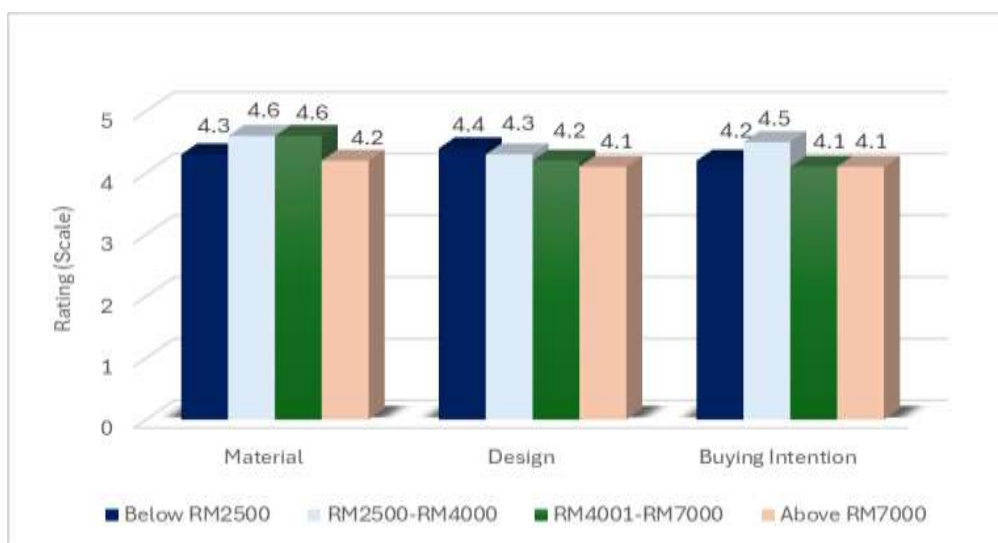


*\* Rating 1 to 5 (with 1 representing strong disagreement and 5 representing strong agreement)*

**Figure 4**. Mean rating of product attributes based on age variable

**Monthly Income**

The third demographic variable is respondents' monthly income, which is categorized into four ranges including below RM2500, RM2501 to RM4000, RM4001 to RM7000 and above RM7001. According to the data analyzed in Figure 5, for the respondents that earning below RM2500 income a month, the ratings are relatively similar for the three product attributes, with material at 4.3, design at 4.4, and buying intention at 4.2. This suggests that low-income consumers value design slightly more than material, but both factors moderately influence their buying interest. The material attribute received the highest ratings from respondents whose monthly income ranged from RM2501 to RM7000. Respondents at higher income levels tend to spend more as their consumption and needs increase with an improvement in income (Ahmed et al., 2016). This also suggests that furniture made from wood slabs has strong market potential, particularly for consumers who prioritize and appreciate eco-friendly products. Furthermore, this scenario provides an opportunity for lower to middle-income consumers to purchase high-quality solid wood furniture at a more affordable price. The highest income group (above RM7001) shows a balanced distribution of ratings, between 4.1 and 4.2 for all three attributes. It shows that higher-income respondents may be less influenced by these individual aspects and could be considering other factors such as commercial raw materials and brands or exclusivity considerations. Furthermore, positive consumer perception, in conjunction with consumer behavior, could further influence higher consumers' buying intention (Zhang et al., 2021).



*\* Rating 1 to 5 (with 1 representing strong disagreement and 5 representing strong agreement)*

**Figure 5**. Mean rating of product attributes based on monthly income variable

**CONCLUSION**

This product has been successfully designed and produced using *Casuarina* spp. wood slabs. The findings reveal that respondents from various demographics variables, including different genders, ages, and monthly income levels, found the product as well acceptable. Most respondents supported the use of wood slabs (wood waste) as the primary raw material for the coffee table due to its high quality, practicality, and distinctive features. This study also

highlights the viability of wood slabs as a viable alternative material in the furniture industry, with respondents noting the environmental benefits of recycling surplus wood sources. Furthermore, respondents agreed that using wood slabs could help address issues related to surplus sources and the rising costs of commercial solid wood species. In terms of design, the product distinguishes itself from other coffee tables on the market by incorporating wood slabs, creating a unique aesthetic. The addition of expanded metal also enhances the table's visual appeal, aligning with modern and rustic design concepts that are likely to attract younger consumers. Overall, the product has gained customer acceptance and interest, demonstrating its commercial potential in the current furniture market. Future research could explore the application of other recycled materials in furniture design, further contributing to sustainable practices in the industry.

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## AUTHOR CONTRIBUTIONS

**Nur Hannani Abdul Latif**: Conceptualization, data analysis, writing original draft and writing review. **Muhamad Haikal Hamdan**: Methodology, data analysis and writing original draft. **Junaiza Ahmad Zaki:** Writing review and editing. **Amran Shafie:** Material Preparation and Methodology. **Ahmad Fauzi Awang @ Othman:** Material Preparation. **Norashikin Kamarudin:** Conceptualization.

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## DATA AVAILABILITY

Not applicable.

## COMPETING INTEREST

The authors declare that there are no competing interests.

## COMPLIANCE OF ETHICAL STANDARDS

Not applicable.

## SUPPLEMENTARY MATERIAL

Not applicable.

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