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Bamboo Partition

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Abstract: Bamboo partition is important for element of ergonomic improvement in developing countries. It focuses interior, and also offer a higher look and additional valuable in the market and the suitability of material for produced bamboo partition using a simple design. The wall partition that made by recycle furnitures were produced, and the data were collected via survey form. The data were analyzed using SPSS based on questionnaire that had been distributed to 100 correspondents. Most 80% of the correspondents give positive response to the material used, suitability, portability, simple design and price. From this study, it can be concluded that bamboo partition can be accepted by all age level, gender and also a profession. Most of correspondent agreed that partition made by bamboo give the traditional view. Most of the correspondents agreed for this product that can give be commercialized in furniture industry.

Keywords: Bamboo, Commercialized, Partition

1. Introduction

Furniture industry has changed over the years. It is no longer restricts itself to a production of a chair or a table or a bed but today it includes manufacturing of a range of furniture and home furnishings and designed interiors which mean category and elegance. Changing lifestyle, economy growth, increasing migration to urban areas has all contributed to the demand for furniture and in turn the growth of the furniture industry as whole. Furniture industry comprises the production of a wide range of products related to office, living room, bedroom, kitchen, garden, school furniture in furniture. A wide variety of raw materials are used in production of furniture like wood, rattan, plastic and metal and more recently silver. Various varieties of wood, wooden furniture are the major production and exports of the furniture industry in almost every country. Education in design is a mean to design know what and knowledge which are the means to a qualified design work which is a mean to well-designed processes and products which are means to economic competitiveness which is a mean to job creation which is a mean to economic wealth which is a mean to quality of time (Hardt, 2006).

Generally, bamboo is categorized as a grass and not a tree and bamboo also can be the world most sustainable reserve. Bamboo is an attractive material due to its incredible strength, regenerative properties, and its natural visual beauty. Bamboo has a very long history with human kind. Bamboo chips were used to record history in very old China. Bamboo is also one of the oldest building materials used by human kind (Abd.Latif, 1990). Bamboo also has been recognized as one of the most important non-timber forest products and is considered to be an appropriate alternative to timber in this era of fast reduction of wood supply from the forest. Bamboo has fast growth rate and can refill itself after harvest. Compare to wood, bamboo has a higher strength to weight ratio, which facilities the harvesting, transporting, and manufacturing of products (Anwar et al. 2009, 2011).

Bamboo is a hollow tube, sometimes with thin walls, and consequently it is more difficult to join bamboo than pieces of wood. Bamboo does not contain the same chemical extractives as wood, and can results glued very well (Janssen, 1995).Bamboo's diameter, thickness, and intermodal length have a macroscopically graded arrangement while the fiber distribution exhibits a microscopically graded architecture, which lead to good properties of

bamboo (Amada et al. 1997). This is mainly due to the fact that like wood when in contact with moist ground, they improve and decay very quickly if treated with some very effective preservatives (Sharma, Dhanwantri and Mehta, 2014).

The most extensive use of bamboo in construction is for the walls and partitions. The major elements, the posts and beams, generally comprise part or structural framework. Bamboo will continue to play an important part in the development of enterprises and the transformation of rural environments (Sharma, Dhanwantri and Mehta, 2014).

1.1 Objectives

Objectives of study are to create a new design of partition made from bamboo and wood waste, to promote the marketability product of as a raw material and to evaluate the potential of bamboo product in furniture industry.

2. Literature Review

2.1 Bamboo Industry

In recent years, the use of bamboo has been enhanced to exploit bamboo as a renewable wood fiber. Sequence in theoretical and applied research on bamboo-based products has increased year by year and expanded its use in almost all applications, mainly in building, furniture, product, transport, packaging and others. Bamboo composite was recognized in the global market in applications swap traditional wood interior and exterior products (Hongyan, Miao and Ding 2009). This proves the strength of bamboo is found 10 times stronger than wood materials (Normiadilah, Othman and Noriah, 2012). A variety of positive advantages found in composite products from bamboo as dimensional constancy, long life, conditions resistant, high force resistant, low protection, non-toxic, low flame spread and other (Murali, Mohan and Ratna, 2010).

Bamboo is the most varied group of plants in the grass family. It belongs to the sub-family *Bambusoideae* of the family *Poaceae* (*Gramineae*). It is a durable, versatile, and highly sustainable material, one that people and communities have known and been utilized for thousands of years. They are among the fastest growing plants on the planet. Bamboo is extensively available in Peninsular Malaysia. However, research on bamboo for information about the importance and suitability for commercial purposes very little progress. Since there is a lot of potential that can be developed to study the bamboo plant has been carried out. This study was conducted to obtain basic information characteristics of bamboo through the identification and study the results obtained through the cutting process and the production of strip with a size that is loyal to manufacturing floor (Hongyan, Miao and Ding 2009).

2.2 Marketing of bamboo

The potentials in the bamboo market with the growth for the environmentally friendly green product, in the world bamboo market is very expected to the double in 2015, the market of bamboo from USD 10 million to the USD 20 billion (Xuhe,2003). Bamboo is an abundant resource that grows in many part of the world, Traditionally used as low cost construction material in developing countries, bamboo is being processed into increasingly sophisticated product that serve consumer in developed countries and high end market. Nowadays, with new technologies for processing such as new technology most products made from wood can be made with bamboo, resulting in the potential for a multibillion dollar market (Xuhe, 2003).

2.3 Wall partition

The most general use of bamboo in construction is for walls and partitions. The major elements of a bamboo wall (posts and beams) generally represent part of the structural framework. As such they are required to carry the self-weight of the building and also loadings required by the occupants, the weather and, irregularly, earthquakes. A partition wall may be defined as a wall or division made up of wooden, glass or other such material and provided for the purpose of dividing one room or portion of a room from another. Partition walls are designed as non-load bearing walls. It may be of folding, collapsible or fixed type. If partition walls are load bearing then they are called as ‘internal wall’. These are fixed and movable partitions. Designed and made in a perfect blend of latest and contemporary design, the panels we offer are acclaimed for their aesthetic appeal, flawless polishing and resistance against borer and termite. These are extensively used in homes, offices and hotels for partition purposes. Further, the unique appeal and excellent polishing of these partitions make our products widely demanded by the patrons. Wooden partition is lighter in weight and easy to construct it also not suitable for damp locations (Janssen, 1995).

3. Materials and Methods

There were two methods in producing bamboo partition. The first phase was design process (Figure 1) and the second phase was manufacturing process.

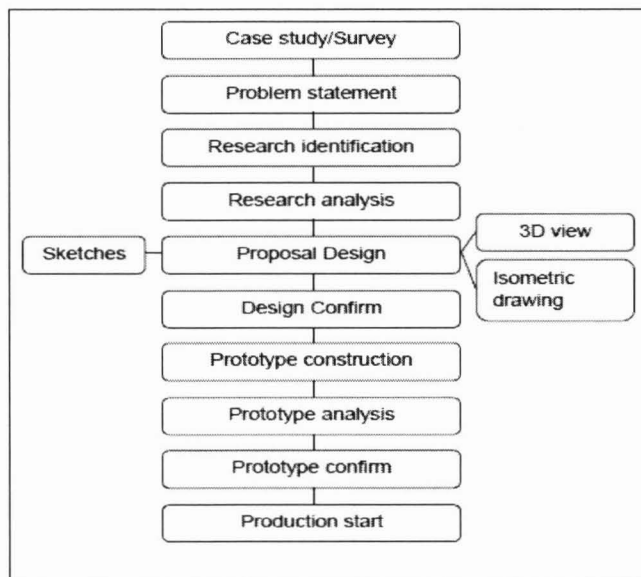


Fig. 1 Flow chart design

The chosen design has been proceed to the manufacturing phase. The raw materials that been used to produce bamboo partition were, bamboo (*Gigantochloa scortechinii*) or Buluh Semantan and wood waste (mixed wood species). Bamboo culms were splitted into 12 parts using bamboo splitter. Then, bamboo strips have been planed into 2cm width. It is more easier to combine all the strips to make wall of the partition. To laminate the bamboo strips, each strip was glues horizontally and vertically. A few set of bamboo laminated were clamped for 24 hours to make sure the glue cured thoroughly. After three sets of laminated bamboo were formed, the suitable jointing has been applied to join the laminated bamboo and its frame (Figure 2). Each set of laminated bamboo has been decorated with a mirror and all the laminated bamboo were supported using hinges.

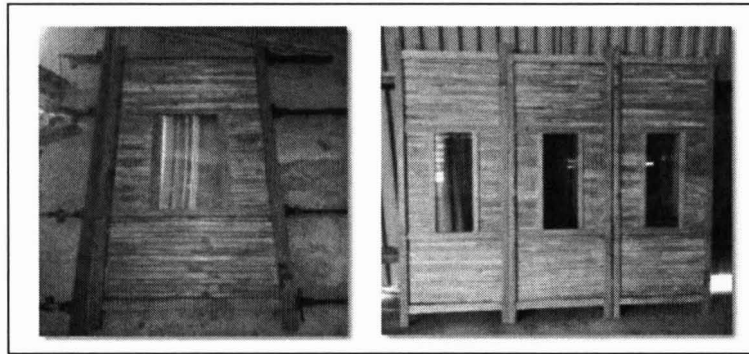


Fig. 2 Bamboo partition

4. Results and Discussion

This result was analyzed from the questionnaire that has been distributed to 100 correspondents among student, staff (UiTM PAHANG) and others. The questionnaire contains of five (5) questions and each question has been ranked in Table 1:

Table 1. Ranking for survey form

No. of Rank	Description
1	Poor
2	Moderate
3	Good
4	Very Good
5	Excellent

Table 2 shows the statistical analysis of the bamboo partition effect on gender, age and profession. There were six (6) elements have been evaluated on correspondent satisfaction. The six elements are material used, sustainability of wood waste, interior design, portability, traditional looks and price.

Table 2. Result statistical analysis of F-value bamboo partition effect on gender age and profession

Source of variance	D f	Raw material	Sustainability of wood waste	Interior design	Portable	Traditional looks	Price
Gender	1	0.403 ^{ns}	0.293 ^{ns}	0.318 ^{ns}	0.966 ^{ns}	0.656 ^{ns}	0.666 ^{ns}
Age	2	0.641 ^{ns}	0.045 [*]	0.601 ^{ns}	0.979 ^{ns}	0.365 ^{ns}	0.164 ^{ns}
Profession	2	0.108 ^{ns}	0.389 ^{ns}	0.601 ^{ns}	0.143 ^{ns}	0.127 ^{ns}	0.10 ^{ns}
Gender*age	1	0.612 ^{ns}	0.269 ^{ns}	0.051 [*]	0.653 ^{ns}	0.188 ^{ns}	0.995 ^{ns}
gender*profession	1	0.688 ^{ns}	0.708 ^{ns}	0.123 ^{ns}	0.520 ^{ns}	0.308 ^{ns}	0.654 ^{ns}
Age*profession	1	0.480 ^{ns}	0.799 ^{ns}	0.638 ^{ns}	0.735 ^{ns}	0.621 ^{ns}	0.923 ^{ns}
Gender*age*profession	1	0.997 ^{ns}	0.799 ^{ns}	0.537 ^{ns}	0.845 ^{ns}	0.289 ^{ns}	0.069 [*]

Note: $p < 0.01$ highly significant (**)
 $p < 0.05$ significant (*)
 $p > 0.05$ no significant (ns)

4.1 Raw Material

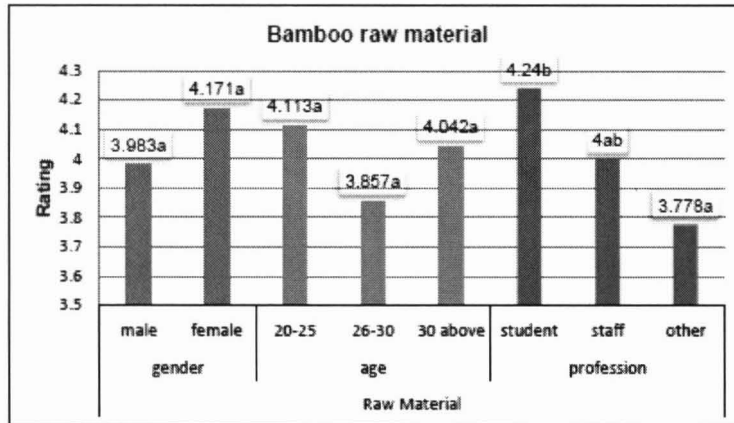


Fig. 3 Raw Material

Based on material used (bamboo) Figure 3, the result shows that there is no significant different between gender and age, but there is significant different between profession. The students rated that the raw material is very good to be applied for this bamboo partition compare to staff and other. This is because, might be student prefer new material instead of using solid wood. A major advantage of bamboo is its ability to be worked by hand using very simple tools (Zhang, 2003).

4.2 Sustainability of Wood Waste

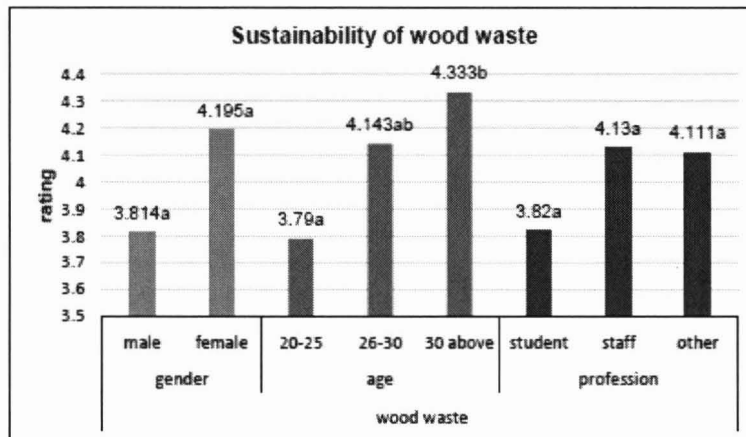


Fig. 4 Sustaibility of wood waste

The result shows (Figure 4), there is no significant different between gender and profession, but there are significant different between age. For age 30, the correspondent gives a “very good” rate because they thought by using wood waste as same characteristics with the other species and good for furniture market. For the age 20-25 and 26-30, this is because, might be wood waste is not suitable for making furniture product and suitable for particleboard, wood chip and other. They are also less knowledge about wood waste. Wood waste can be a potentially important resource for the manufacture of various materials and products (Top, 2014).

4.3 Suitable for Interior Furniture

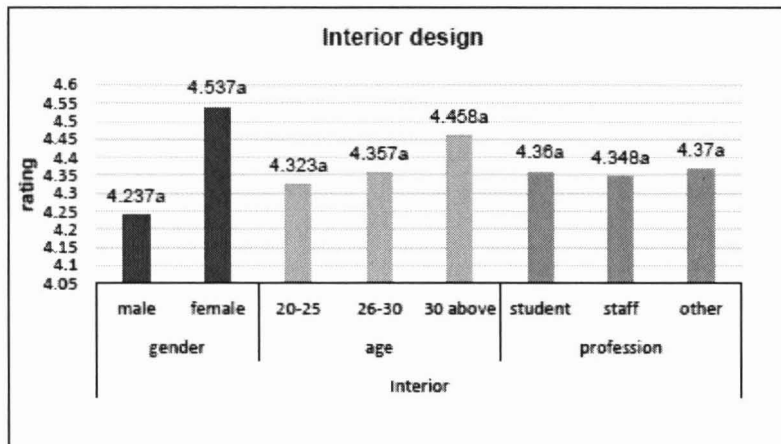


Fig. 5 Interior Design

The result shows (Figure 5) there are no significant difference between for age and profession, this because the ratings of the age and profession correspondents rated were “very good”. The product is more suitable use for interior design rather than outdoor. For the gender, mostly the female correspondent gives “very good” rates for this survey better than the male. This is because the product use clear finish, that not suitable for the outdoor furniture and suitable for indoor also this product use clear finishing can make the product more beautiful and attractive for interior furniture.

4.4 Portable and Easy to Handle

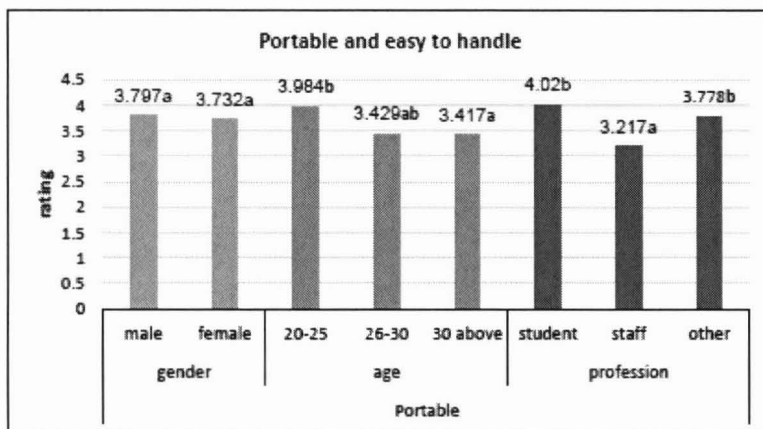


Fig. 6 Portable and easy to handle

The result shows (Figure 6) there are no significant differences between the genders compare the age and profession. For the age 20-25 and 30 rated that the handling was good, this is because product usually this wood was medium weight also the bamboo partition can be fold and easy to handle. But it is significant differences for age 26-30. This is because, might be too heavy and require more than 1 to handle. Meanwhile for the profession, the students show correspondent give a “very good” rates, it might be the students are very good knowledge and good physical.

4.5 Simple and Traditional Style Partition

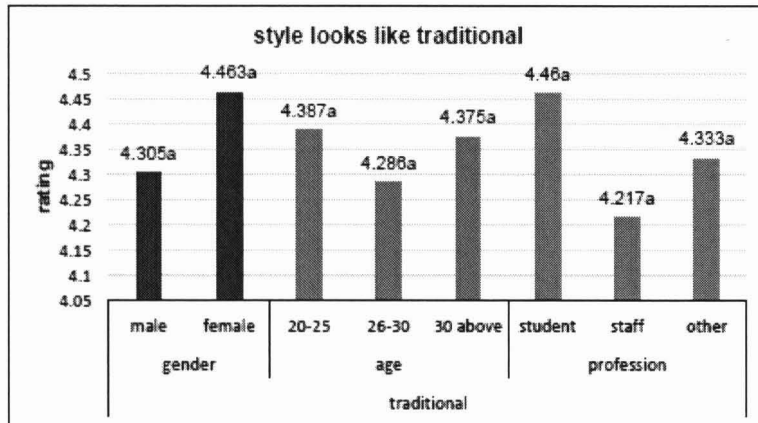


Fig.7 Traditional Style

The result shows (Figure 7) the rating of correspondents have no significant difference between gender, age, and profession. All of the correspondents give a “very good” rate, which the product partition is simple, but with a traditional style partition, because this design depends on bamboo and wood grain, where it gives its own style.

4.6 Market Price Between (RM400.00 - RM500.00)

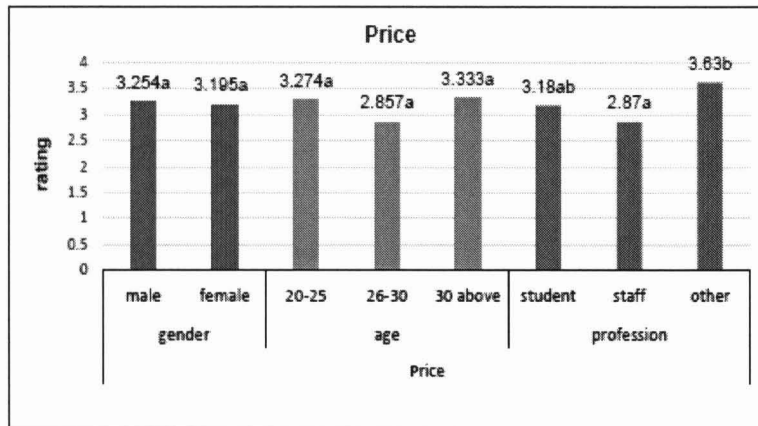


Fig. 8 Price

The result shows (Figure 8) , based on age and profession, there is significant difference from the correspondent’s responses, while for graph of gender there is no significant difference obtained. Among the correspondents in age group, there are significant differences between 20-25, 26-30 and 30. For age 20–25 and 26–30 the correspondent gives a “good” rates because they thought used bamboo as a material is difficult to assemble. For age 30, they have a different perception. While for profession, between student and other, they are all “good” even though there are still significant different with staff. A few of correspondents staff rated “moderate”, because the price not affordable and they suggested the price should RM 300 only. On the other hand, students and others rates “good” because for them is quite difficult to manufacture the partition made from bamboo.

5. Conclusion

From this study, it can be concluded that bamboo partition can be accepted by all people. Bamboo partition is the new design that is a combination of wood and bamboo. Although it simple, its look like traditional product. Most of all genders accept the use of bamboo in the design. Also bamboo can replaced in the use of wood resources is increasingly threatened. The design is very important thing that manufacturer has to care about in making the furniture. The design must be simple and less number of components. The principles of design such as balance, harmony, movement and pattern should be included as it will produce good furniture. Other than that, use bamboo as material can incredibly green, eco-friendly building material. This is because bamboo grass stalks can grow very rapidly, attaining full height in just 3-5 years. Further, when it is harvested the roots do not need to be cut, so it can continue growing without need for replanting. Bamboo is also all natural, can be recycled, and is biodegradable. Furthermore, design partition from laminated bamboo board suitable in the market because the design is very simple and style looks like traditional, lightweight and very suitable for interior furniture. Other than that, suitability design partition in the market can attract many people to buy this product. As a recommended, the standard survey questionnaire should be made for standardized the questionnaire. This product must focus on finishing processes such as; in using tools, technique and environment. Good appearance and look more decorative it depends on finishing method and design pattern also needs to improve for creating unique design. Use the modern technology for making good product and better quality that make from bamboo. Other than that, government need support and promote to the furniture manufacturing use bamboo as a material for the production of furniture in the market that can give many advantages to the company of furniture to enter the market in the world.

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