

Multifunction Rack made from Kelempayan (*Neolamarkia cadamda*)

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Abstract

Space is a constraint that is beginning to hit people these days. With an ever rising population, the demand for space is only bound to increase with time. To overcome this situation, smaller profiles of furniture are made to conserve space. Another way in is to produce a multifunction furniture. Multifunction furniture has been a trend in houses especially people who live in small spaces. This paper discusses more on the multifunction rack that can be used as a rack and table at economical price. The arrangement of the product can be specified as customer satisfaction and taste. Moreover, Kelempayan (plantation species) had been used in this study as raw materials that suit limited spaces at economic price. A set of questionnaire were evaluated regarding the suitability of material used, handling, ergonomics, spaces, function, commercial value and price. 100 respondents among the lecturers, public person and also students were distributed with the questionnaire. From the questionnaire, it was found that the product was acceptable to all the respondents and the concept of multifunction product that suitable for limited space suitable to be commercialized.

Keyword: multifunction product suitable for limited space.

1. INTRODUCTION

1.1 General introduction

Furniture is made to create human life easier and more comfortable. Furniture industry in Malaysia nowadays has changed into a technologically advanced compared to the traditional technique. With these technologies, it has improved the production manufacturing competence in term of design, market expansion and advancement for further prospective of exporting in global market share.

The design of furniture at times is influenced by on where and how the furniture will be functional. Basically, outdoor furniture design is simpler and easy to carry if compared to indoor furniture. The designs are usually more practical because outdoor furniture is always dealing with weather, temperature and the surrounding environment.

There are two elements that are important in furniture design which is practicality and visual appearance. The overall combination of practicality is the practical elements necessary to create the product. A manufactured product certainly has a specific function and is made using a combination of suitable materials and installation for a better assembly. While visual appearances are related to the aesthetic value and the joined product order form, shape, colour and decoration is to make a balanced combination of the products.

These two aspects are different from each other. Aspect in practicality is more to the suitability of materials, suitability of construction, ergonomic and anthropometric and standard specification. While visual appearance

related in form, shape, proportion, design balance and decoration.

The uses of wood as a primary material in the furniture making cannot be denied despite the material such as steel, aluminium, glass and plastic has been used nowadays. There are few benefits of using wooden furniture that cannot be denied. First and foremost are the strength and the durability of the wood. This will give a sturdy furniture while requires less number of repairs. Secondly is ease of maintenances, once it has been applied with a finishes the maintenance are not required. Next is wooden furniture are flexible, the look can be reformed over time to give a better touch of sense. Wooden furniture also can be refinishing all over again by sanding, staining or painting it again.

Ergonomics can be defined simply as the study of work. More precisely, ergonomics is the science of designing the job to fit the worker, rather than physically driving the worker's physique to suit the job. Moreover, Ergonomics relates information on human behaviour, aptitudes and restrictions and other characteristics to the design of tools, machines, tasks, jobs and environments for productive, safe, comfortable and effective human use (McCormick and Saunders, 1993).

1.2 Problem statement

Space is a limitation that is begins to hit people these days. With an ever growing population, the demand for space is only bound to increase with time. To counter this circumstance, smaller profiles of furniture are made to counter space. Another approach in is to produce a

multifunction furniture. Multifunction furniture has been a trend in houses especially people who has lived in small spaces. The furniture is designed to help people in saving living space. For instance, sofa beds can function as beds and seats.

In addition, to generate the best application of space, the furniture may be designed to some extent smaller than traditionally-sized furniture, or can be used for more than one function. Limited space with lot of furniture will come to be uncomfortable for living space. Right furniture should well-organized with the right and the best furniture by trying to remove unnecessary furniture and selecting functional and practical furniture. Multifunction furniture will save the budget on buying only one furniture rather than extensively large furniture with one function.

1.3 Objectives

The objectives of this study are:

- 1.3.1 To design a multifunction rack by using Kelempayan wood species *Neolamarckia cadamba*.
- 1.3.2 To manufacture multifunction rack that suit limited spaces at economic price.

2. MATERIALS AND METHODS

2.1 Materials

A material used to produce the product was Kelempayan (*Neolamarckia cadamba*). The sizes were cut according to the bill of materials provided in Appendix A. Hardware used was dowel. All of them were provided by UiTM Pahang Workshop.

2.2 Methodology

2.2.1 Production Process

The flow chart of the production process is shown in Figure 1. The production process started with logging Kelempayan wood species *Neolamarckia cadamba* from UiTM Pahang forest. The log was cut and dried in the kiln dry until reaching 12% of moisture content where it is the best moisture content for furniture making. The drying process took 2 weeks until its ready to use. After dried, the woods have been cut into a particular size in the assembly process. At the cutting process it goes through 3 machines which are thickneser, straightener, multiple rip saw and circular saw. Each machine cut and trimmed according to the part list. In addition, the completed strips were glued together and clamped to get actual width. Then it goes to finishing process to protect and enhance the materials a product. For finishing process, two layers of sealer were used and three layers of clear coating were used as top coat.

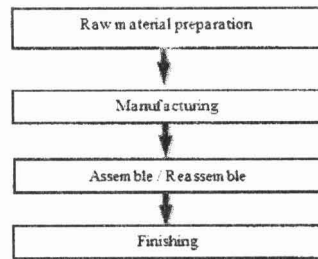


Figure 1: Flowchart of Production Process

2.3 Research Instrument (Questionnaire)

This research utilized quantitative research methods. The instrument used to collect the data was a questionnaire. A set of questionnaire containing a certain number of questions divided into two parts which is background information and question regarding the topics. The question consists closed question (provide boxes for the respondent to tick). The question has been ranked as shown in table1. The respondents of this study were among the lecturers, public person and also students from both genders. The questionnaires were distributed at various locations and places. All data were recorded and analysed by using SPSS. Independent T-test and one-way ANOVA were used. This is normally expressed at the 95 percent confidence level. The $LSD_{0.05}$ is a calculated figure that producers can use to determine with a confidence level of 95 percent that the yield difference between two or more variables.

Table 1: Rank provided for respondent choices

Rank
1 – Strongly disagree
2 – Disagree
3 – Moderate
4 – Agree
5 - Strongly agree

3. RESULTS AND DISCUSSIONS

3.1 Analysis of variance (ANOVA) on the effect of gender, age and employment status.

Table 2 showed the result of analysis of variance on the effect of gender, age and employment status. The ANOVA test is used to determine the impact independent variables have on the dependent variables in a regression analysis. The independent variable were gender, age and employment status, while the dependent variables comprising materials used, handling of material, ergonomics, space, function, commercial value and the price of the product.

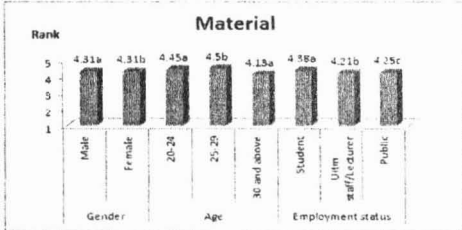
Table 2: Analysis of variance on the effect of gender, age and employment status

Sources	df	Material	Handling	Ergonomic	Space	Function	Commercial Value	Price
Gender	1	0.33 ^{ns}	0.29 ^{ns}	0.18 ^{ns}	0.68 ^{ns}	0.7 ^{ns}	0.69 ^{ns}	0.21 ^{ns}
Age	2	0.04 [*]	0.28 ^{ns}	0.01 ^{**}	0.52 ^{ns}	0.01 ^{**}	0.62 ^{ns}	0.04 [*]
Employment Status	2	0.52 ^{ns}	0.09 ^{ns}	0.85 ^{ns}	0.35 ^{ns}	0.47 ^{ns}	0.62 ^{ns}	0.04 [*]

Note: P<0.01 highly significant
P<0.05 significant
p>0.05 not significant ^{ns}

Based on the Table 2, it showed that there were no significant differences between both gender male and female. Between male and female doesn't affect the choosing of materials used, handling of material, ergonomics, space, function, commercial value and the price of the product. Both of them to seem agree with the product. Meanwhile, for the age indicated four significant differences on materials used ergonomic, the function of the product and the price. It was also shown that there were highly significant differences on function and price. Lastly was employment status between student, UiTM staff/lecturer and public, this three differing status giving a significant difference just on the price of the product.

3.2 Graph of average rank chosen by respondent.



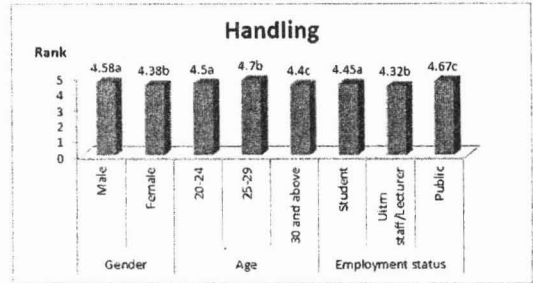
*Different letters indicate not significant while same letters indicates significant

Figure 2: Graph of Average Rank Chosen by the Respondent on Materials

Figure 2 shows the average of satisfaction that has been tick by the respondent regarding material used in production. The question state whether the respondent agrees with the uses of Kelempayan wood species as the main material in the production of multifunction rack.

Between both genders, it's shown that both of them have equal number of ranks with 4.31. For the age groups, 25-29 has the highest from the rest but there are no significant differences between them. At the same time, it showed that between age 20-24 and 30 and above, there are significant differences between it. It is assumed that between these two stages of age have differing views in using Kelempayan wood species as main raw materials. For the age 20-24 might prefer more lightweight and simple materials such as block board, plastics and others.

While age 30 and above more likely prefer wooden materials as their furniture and they might be familiar with the species, also attract to the appearance of the grain of the wood. Same goes to employment status, students, UiTM staff/ lecturer and public, there were no significant differences. Overall, the respondent like and prefer Kelempayan used as main materials for this product although there were slight differences in ages.

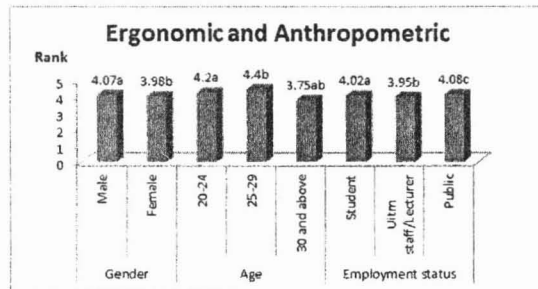


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Figure 3: Graph of Average Rank Chosen by Respondent on Handling of Product

Based on Figure 3, the average of satisfaction that has been tick by the respondent regarding the handling of the product. As mentioned in literature review, Kelempayan (fall on the light hardwood and has a density between 290-465 kg/m³ this will influence the weight of the final product.

The graph indicates that there were no significant differences between all of the variables genders, ages and employment status. In gender, male most likely agree than female because of male have bigger physical than female, but both of them can easily handle the product wisely. At group age also give a positive feedback to the product during handling, this is because of the weight of the product is acceptable, which same with the employment status.



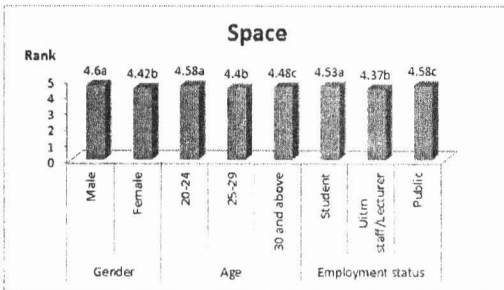
*Different letters indicate not significant while same letters indicates significant

Figure 4: Graph of Average Rank Chosen by the Respondent on Ergonomic

Figure 4 shows the average of satisfaction that has been tick by the respondent regarding the ergonomic and anthropometric concept that applied to the product. Ergonomics concerned with the understanding of

interactions among humans and other elements. The simplest way to express is how the product fit person to use it. While

First of all, there was significant difference showed at the graph of age. It is between the age of 20-24 and 30 and above also between 25-29 and 30 and above, this indicates that these groups of ages have a different idea on how ergonomics work for them. So, each category of age tends to argue with the ergonomics of the product. This might also influence by the body measured from these three stages of age. The size of the product also should be precise according to each stage.

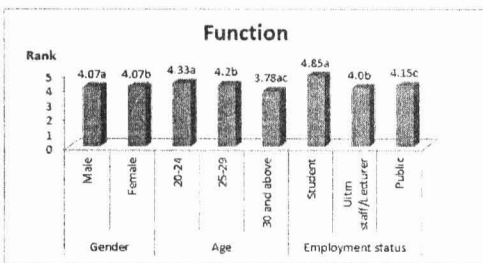


*Different letters indicate not significant while same letters indicates significant

Figure 5: Graph of Average Rank Chosen by the Respondent on Space Used

Figure 5 shows the average of satisfaction that has been tick by the respondent regarding space that the product meeting space, is that the product suitable for a limited space or not. It is an objective of this study to know the product suit limited space that customer prefer. Smaller size of furniture also will help the customer save space.

From the graph, it seems that all customers show positive impression on how the product can counter limited space. To some extent, the concept of multifunction furniture also giving role in saving more space to another. Between male and female, the male has more tended to agree with the saving space. Meanwhile for group age, the highest one is at the age 20-24 followed with 30 and above and lastly 25-29.

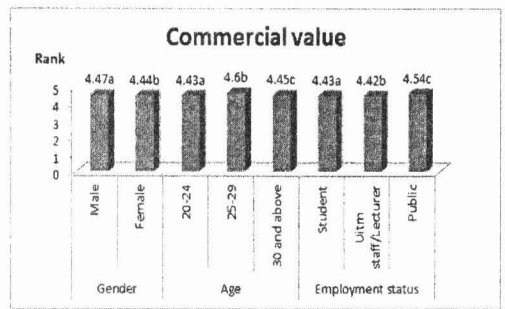


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Figure 6: Graph of Average Rank Chosen by the Respondent to Function

According to figure 6, the average of satisfaction that has been tick by the respondent regarding the multifunction of the product. The function that can be used for this product was a rack and a small table. Between the two functions, respondent also can apply any kind of arrangement as they like. It is because this product has two different parts that can be separated.

There was a significant difference between the ages of 20-24 and 30 and above. Between these two stages of age, 20-24 has higher rank compared with another one. It assumes that age 20-24 more prefer on both functions given by the product, meanwhile age between 30 and above choose the product as a rack or book storage rather than small table. It can relate to the employment status that show student ranked higher than the two other status of employment

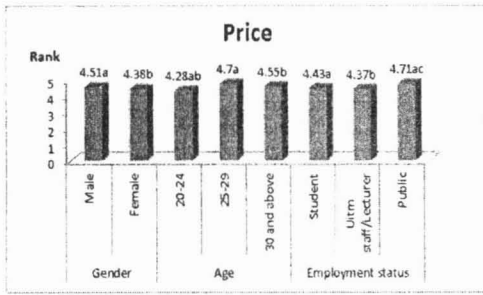


*Different letters indicate not significant while same letters indicates significant

Figure 7: Graph of Average Rank Chosen by the Respondent for Commercial Value

Figure 7 shows the average of satisfaction that has been tick by the respondent regarding the commercial value of the product. The question asked whether this product can be commercialized to the market and the response were tremendous given by respondent. The commercial value also been influenced by the appearance and design of the product.

The majority of the respondent gives positive feedback on commercialized the product. There were no significant differences between groups of gender, age and employment status. This showed that this entire of three groups doesn't affect the commercial value of the product. Male tend to see this product being commercialized than female although the difference was slightly little. Same goes with age, the highest one is 25-29 followed by 30 and above and 20-24. Lastly was employment status, public were more agreeing for this product to be commercialized, while student showed the lowest.



*Different letters indicate not significant while same letters indicates significant

Figure 8: Graph of Average Rank Chosen by the Respondent on Price Given

The figure 8 shows the average of satisfaction that has been tick by the respondent regarding pricing for the product. The price has been decided after part list and bill of materials were calculated. Each of it was considered based on the materials and hardware used. Labour cost and profit also taken into account so that the price still affordable for the customer.

Based on the graph, there were significant differences in age and employment status. For ages, it showed that 20-24 had significant difference with the age of 25-29 and 30 and above. This situation occurred the youngster or teenagers which categorised in 20-24 did not fix income if compare to the other. While employment status the significant indicates between student and public. The reason can be assumed same as said before. In addition, the public tend to have knowledge on the price of difference furniture. For some reason most of the respondent comment that the price should be higher than given. It assumes that the product can be sold with more profit because the appearance of wooden touch gives a unique and enhanced aesthetical value to the product.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

This research is to design a multifunction rack by using the Kelempayan wood species suit limited space at economic price. The data were collected by randomly distributing questionnaire to 90 respondents comprising students, lecturer or staff from UiTM and public with difference gender and age stages.

As a conclusion, it was found that the product that made from Kelempayan wood species was acceptable to all the respondents and the concept of multifunction product that's suitable for limited space and economic price suitable to be commercialized.

4.2 Recommendations

Based on the findings and conclusion of the study, it was recommended that the price should be reconsidered

because of Kelempayan gives an aesthetic value to the appearance of the product. Moreover, the product should be re-designed because the product has a sharp edges and it can bring harmful to the user. The edges should be smooth to give comfortless to the users.

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