

DEVELOPMENT OF NEW FURNITURE USING NATURAL RAW MATERIAL AND SLIVERS FROM WOOD INDUSTRIAL

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Abstract

The objectives of this research are: 1) to study the information in regard to the waste of wood industry which suit to be used as raw materials of home use and home decoration resources. 2) After that, the collected information and knowledge is integrated to be a guideline for development the design of the new product prototypes. 3) Finally, the new product prototypes are developed to fulfill the target consumer group's satisfaction. For example, the Prakanong-Kha-Mai industry do architrave business. The populations of interest which are sampling in this study are product consumer in general. This customer group criteria of earning specific income and residing in central Thailand. The random general customers have 160 persons. Moreover, the product consumer specifically with the criteria of interest in home decorative items and furniture, earning a specific income and residing in central Thailand. A simple random sample results in a sample size of 196 persons. The indicator which is used in this research is gather data by interview and questionnaires designed by researcher. Finally, the gather data are analyzed by percentage, arithmetic means, and standard deviations.

In part of studying and development of product, the researcher used the five designed products by using wood residues from wood industry and seeds as raw materials to be a design guideline. From gathering information about the potential of wood residues in the wood industry, the industry has a systematic wood residues management. They sort the size, shape and type of wood residues result in easier study and solving problem about the material. For other natural material, seed which is still hard, smooth surface, durable was chosen to use as decorating the products

Integrating design product knowledge has focused on the characteristics of a Thai style in the primeval Rattanakosin age. This period, the people started to clearly use the furniture which features. The materials used in production must be in accordance with the terms of the materials and equipment used in the factory. The concept of design also was limited by several conditions such as safety, aesthetic, time and quantitatively. For innovation and sustainability of the product, the mortise, tongue, and groove joint of product was chosen in this research. Tongue is the technique of wood which suit to be used produced industrially.

The development of products from waste materials which are creatively developed to reflect the simple but still keep characteristics of a Thai style. The material is also useful from the rubbish heap. This result in reducing the amount of waste that must be disposed of down. The new product, causing the product uses natural materials, mostly human nature.

As a result of assessment of consumer satisfaction with the product prototypes, the product type 1 was agreed by customers ($\bar{X}=3.65$; $SD=0.84$). The product type 2 was agreed by customers ($\bar{X}=3.73$; $SD=0.82$). The product type 3, 4, and 5 were also agreed by customers. The arithmetic means, and standard deviations of the product type 3, 4, and 5 are ($\bar{X}=3.83$; $SD=0.83$), ($\bar{X}=3.73$; $SD=0.79$), and ($\bar{X}=3.63$; $SD=0.86$), respectively. Almost selected customer. Most consumers satisfy with the product prototypes in the shape. They are addressed as appropriate in terms of forms, suitable materials, uniquely Thai, creativity, craftsmanship, safety, and easy cleaning.

Key word : Furniture Design, wood scraps

Introduction

Due to the high developed science and technology, human has enjoyed the cultivation of natural resource to facilitate fast and comfort social living standard. The exploit has extensively caused negative impact to human and environment in both short and long terms. Natural environment is destroyed, depleted and convert into man-made activities that cause environmental degradation.

Environment deterioration mainly caused by the over consumption of the increasing human population, has created negative impact on the world, such as amplifying global warming that effects climate change, nature catastrophe and environmental pollution.

In 1987, the Thai government policy of “Transforming the Battle Field into the Market Place” has opened door to the development of industrial sector. The numbers of foreign investors had substantially increased and had critically caused problems in managing natural resources, environment and especially in the area of expenditure in dealing with waste materials.

A huge budget was spent in waste disposal. The recycling scheme was in need to implement. The recycling process is not only reducing the waste materials and conserve energy, but also converts it into reusable objects. Subsequently, the cost of production can be reduced in compensation to the high cost and raw material shortages. However, the recycling was unheard and barely set up, probably due to the lack of any proposed actions.

Thailand’s 11th National Economic and Social Development Plan [2012-2016], has envisioned that all Thais and all segments of society have equal opportunity and access to resources, and will share the benefits from development fairly. This has led to the rising in awareness among the Thai public to take the positive environment action. As this has been recognized, a proper recycling should be managed in consistent to publics and government ground in order to benefit both the environment and human.

Waste are things that are no longer in use or wanted, worthless and discarded. Since the expansion of industrial sector, the rise in the number of scrap and waste has increased significantly, and the concept of recycling “waste” has in the same time drawn the attention of designers when designing any new products.

There are various types of non-hazardous solid waste; but primarily there are two types; the municipal solid waste such as household garbage, horticulture, commercial waste; and the industrial waste such as left over materials resulting from the production of goods. In the past there was no effort to improve this waste by recycling. Most of this kind of waste, with the proper and advance technology, can be sorted out by Material Recovery Facilities. It is designed to separate the combined recyclables into their individual material streams and prepare them for reuse or sale in the commodity markets. Materials Recovery has been increasingly important in providing quality raw materials to the industry. Therefore, the waste recovery through recycling and reuse methods has enable manufacturers to secure access to new source of materials. One manufacturer’s trash can become another manufacture’s raw material.

In wood industry such as wood processing plants or wood-based manufacturers, almost every wood related business or organization generates and disposes wood waste like swarf or chips. This can be categorized as:

1. Off cuts, short or unusable boards generated by carpentry work in furniture company
2. Off cuts, generated from human error in manufacturing
3. Bark, bark dust, removed from logs prior to processing
4. Off cuts, generated due to defects such as knots or splitting by some furniture companies
5. Sawdust, Wood dust, wood chips and other mill waste [sawdust is generated from cutting, sizing, re-sawing, edging, drilling, and milling (shaping) operations.]

The emphasis would be on the recycling of the waste from wood-based manufacturers, such as furniture mills, architectural doors and windows wood work mills, and other equipments from wood- processed manufacturers. Most of these companies generate significant amounts of wood waste that is usually burned for energy recovery or sold to dealers.

At present, recycling technology has been advanced greatly. Waste from wood industry or even agricultural crop residues such as leaves, stems or straws can be easily converted into new useful products. More manufacturers accept off cuts wood and reuse it as raw materials. Altering of process and redesign the products with the smaller wood materials have helped reducing the waste generated and production cost. The whole scheme is in line with the “Cradle to Cradle” framework which seeks to create production techniques that are waste free. And that the manufacturers have taken full responsibility for disposal of goods they have produced by “Reduce, Reuse, and Recycle”.

Objective:

The objectives of this research are as follows:

1. To study, collect knowledge and data about wood scraps from wood-based manufacturers.
2. To integrate knowledge of design, materials and production technology in order to create sustainable innovation.
3. Based on the findings of the research, to develop the new products from wood scraps by using the existing production expertise base.
4. To carry out a consumers satisfaction survey on the new product prototype

Research Framework: [Research Procedures:]

This encompasses the developing of a design for new products which can be fabricated from natural residues and the off cuts wood waste, suitable for home use or home decoration. The fabrication of the products must involve a justified and competitive manufacturing production cost, by mean of the existing mills available.

Research Tools:

The only research tool is the survey instrument constructed by the researcher. It comprises of questionnaires; demographic survey questions, open-ended survey questions, rating scale and check lists. The acquired data will be computed by using the statistic method which is referred as arithmetic mean, data percentile and its standard deviation.

Research Methodology:

The type of research that is used in this study is an applied research. It utilized survey methodologies together with the design process. The processing method of the population and samples are as follows:

Part 1: To selected the SME sampling method survey

1.The sampling of this research is specifically selected the SME “Pra Kanong Kah Mai” or “Pra Kanong Wood Works”, of Suan Luang District, Bangkok; a made-to-order [or OEM] wooden doors and windows manufacture, for this volunteer non-random sampling method survey.

Part 2: To study the requirements of the consumers prior to the design process

Initially, a simple random sampling to represent the entirety of the population is administered at 160 persons, resided in the central Thailand with purchasing power.

Part 3: Data collecting

The data collected indicates that most of the respondents are women, age between 26-40 and 41 years upwards with income ranging from 15,000 to 50,000 Baht.

Respondents purchasing behavior in furniture’s categories are:

- 2.1 Multiple respondents have set plan prior to the purchase but without any estimated budget; any who has plan, would set it around 1,000-1,400 Baht. Almost all would compare prices before purchasing; appearance and colors do affect the sale; furniture and home décor are more interesting than consumer products and souvenirs respectively.
- 2.2 In view of new products development in the areas of:
 1. Furniture goods
 2. Consumer products
 3. Home décor

The respondents mostly would prefer the traditional products appearance, followed by conventional design; earthy colors; made of natural residue or materials combined with others.

Part 4: Concept of the design

Integrating design product knowledge has focused on the characteristics of a Thai style in the primeval Rattanakosin age and factory requirement. This is to establish the exact ideas approach of reusing the off cuts wood waste selected combined with other natural dry hard crop seeds. The new products should have useful function rather than home décor. Natural surface texture of the materials used should be apparently retained as much as possible. New products must be fabricated by the available mills at the existing plant.

With this purpose in mind, design process has led to the creation of products as illustrated.



ideas of wooden dressing mirror shelf in rectangle shape, interchangeable to Buddhist altar



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for books or knick-knack in rectangle shape

Discussion and Conclusion:

Through this research, 5 new products were executed by using the off cuts wood waste combined with natural crop seeds. It can be concluded that:

1. This research has addressed how to choose a useful development process to turn wood scraps and crop residues into recycling goods. The factory mill has also show-off the potential in dealing with wood scraps by sorting out wood waste into various groups of woods, and varies in sizes whether they were generated from off cuts, sliver, chips, sawdust and etc.
2. New design approach has integrated an outstanding Thai identity from early Rattanakosin Era, the beginning of distinctive Thai furniture, into the product prototypes. The fabrications of the products are done by the existing mills within the plant. It is strictly met the competitive manufacturing production cost. Wood works detailing such as tongue and groove, cross lap, are used in the product to attain the sustainable innovation.
3. The new products developed from recycle off cuts wood, has been able to showcase Thai uniqueness. Waste and scrap that was historically discarded, have been reduced and reused efficiently and benefit to human and environment.
4. Base on the measurement of satisfaction rating scale to the product prototypes, the respondents were:



Illustration 1 – satisfaction rating scale (\bar{X} =3.65 ; SD=0.84)



Illustration 2 – satisfaction rating scale (\bar{X} =3.73 ; SD=0.82)



Illustration 3 – satisfaction rating scale (\bar{X} =3.83 ; SD=0.83)



Illustration 4 – satisfaction rating scale (\bar{X} =3.73 ; SD=0.79)



Illustration 5 – satisfaction rating scale (\bar{X} =3.63 ; SD=0.86)

The majority of the respondents are satisfy with the new products execution; with appropriate appearance in materials and construction, poses Thai uniqueness, elaborate, creative, appropriate function, simple cleaning and maintenance, safe to use.

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