

USED CARDBOARD AS ENVIRONMENTAL FRIENDLY ALTERNATIVE MATERIAL

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ABSTRACT: Entering the global marketplace and increase attention to entrepreneurship have made significant enhancement to global market competition. The needs to introduce their products to public will increase and making an exhibition using interactive and attractive booth at the mall or exhibition area as an element to attract more people became an option that has been chosen. The demands of this attractive booth, however, need to meet some qualification such as the ease, the speed, the timeliness in design process, material processing, installation, to dismantling. Unfortunately, the turnover and the need to fulfill for a high booth demand quickly are tend not to be followed by the awareness to choose and use the environmental friendly material (as the use of plywood and duco paint which are not healthy as well for human). Therefore, alternative materials are needed as a solution for this problem. This research aim to introduce used cardboard as alternative material for non-permanent interior, such as booth and other furniture inside, which apply 3R movement (reduce, reuse, recycle), attractive, and inexpensive. This research will be done by experimental method by using furniture and room partition as the experimental object.

Keywords: Alternative Material, Used Cardboard, 3R Movement

1. INTRODUCTION (BOLD, UPPERCASE, SIZE 11)

The quality of the environment, natural and man-made, has unlimited influence on people's behaviour and their physical and psychological well being. Interior designers shape the indoor environment in which people used to do their task and daily activities. It is appropriate to say that, interior designers have a unique role in shaping people's behaviour, through shaping the living space, since they influence society's sensitivity and thinking as well. Interior designers have a unique responsibility and role as the intermediaries between industry and clients (Pilatowicz, 1995: 3-7).

Now, the world is preparing to enter global market era for ASEAN and China in 2015. This era has made a significant enhancement to global market competition. This competition starts from their efforts to introduce their products to the market in exhibitions until their good and save packaging of product for shipping. Cardboards are commonly used in packaging method, which made used cardboard as the waste that needs to be concerned of. As an example, approximately 250 kg waste came from cardboard to make house construction only (Pilatowicz, 1995: 23), this number will increase for house furnishing afterwards.

Fortunately, cardboard waste is the most widely recycled of all packaging materials (Just the Facts Corrugated Cardboard, 2004: 1). In creative industry this waste may become a huge amount and opportunity of alternative materials provided for further development. One of these probabilities is to use used cardboard as furniture and room partition. This effort also hoped to introduce and educate the society about 3R (reduce, reuse, recycle) movement, as the response of global warming issue, as designers has a unique influence in shaping society's sensitivity, thinking, and behaviour.

2. METHODOLOGY

This research is done by using qualitative approach with experimental method. Qualitative approach is a research process and comprehension based on a methodology to investigate a social and humanity phenomenon. This approach is used to investigate any unclear problem, to understand any hidden meanings, social interaction, and to develop any theory, clarify data, and examine history. This method is a research procedure that produce descriptive data in form of written and spoken words came from human and behaviour watched closely.

Experimental method is a method of imposing a condition to one or more groups of experiments whose result were then compared with the group that is free from condition imposed to investigate the causal connectivity. In this research, the experiment is done in some parts. This experiments aims to know better finishing for used cardboard, dimension limitation, construction, type of cardboard can be reuse, and acceptable weight.

3. CARDBOARD

3.1 Cardboard Life Cycle

According to National Specialist Contractors Council (NSCC) in "Reduce, Reuse, Recycle Managing Your Waste" pamphlet 2007, the construction industry creates over 100 million tonnes of waste per year, more than 3 times the amount generated by 21 million household in the UK put together. Over 10% of this waste (13 million tonnes) consists of unused materials; materials that have been delivered to site and ended up in a skip without being used. Cardboard box is waste included in unused material.

Cardboard that has been used as boxes for packaging is called corrugated boxes. Corrugated boxes are used for packaging, storing, and transporting

products to factories, warehouse, retail stores, offices, and homes. Cardboard is the most widely recycled of all packaging materials. Corrugated boxes have fluted, corrugated medium layer (rippled layer), sandwiched between layers of linerboard. Corrugated cardboard can commonly be recycled at depots, in municipal curb side collection programs and through private recyclers.

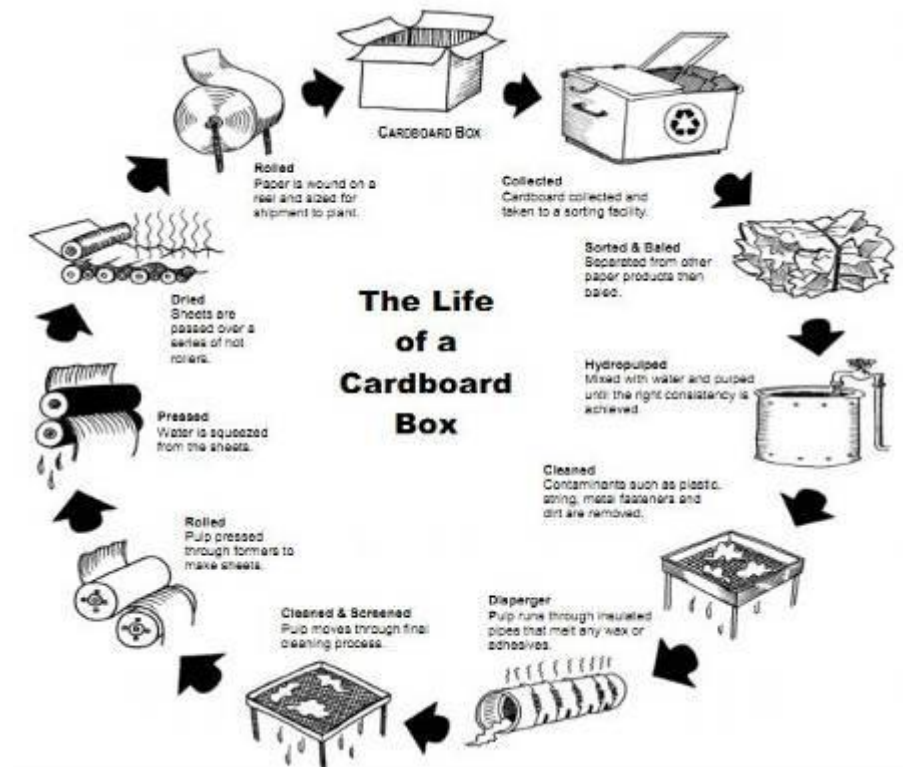


Figure 1. The Life of a Cardboard Box Cycle

Waxed or contaminated corrugated cardboard (cardboard covered with grease, oil, paint, or other material) is not recyclable into new boxes. The contaminants include wax coating, plastics, food, garbage, metal fasteners, staples, and nails. To recycle contaminated cardboard, we have to remove any contaminant because those contaminants may affect the functioning of the machinery and can result in poor quality paper, increase waste, higher maintenance costs, and increase risk to processing equipment.

3.2 Reduce, Reuse, Recycle Plan Program in Indonesia

Reduce, reuse, and recycle (3R movement) are efforts made as a response of global warming issue to make a better living environment by decrease the number of waste. Waste is typically defined as an object or substance discarded by its owner after use since it may no longer has any beneficial use.

By knowing this definition of “waste”, we are hoped to keep reusing it until it was of no value, rather than discard it after it had been used once.

3R movement is an effort made by those who concerned in better resources efficiency in accordance of these following principles:

- Reduce is to eliminate the generation of waste, where possible by stopping it coming on to site in the first place
- Reuse is making use of materials in their original state on the same site or at other site
- Recycle is turning materials into new products for other purpose

The main goal of this process is the specification and use of materials with higher recycle content on future projects to further reduce the demand of natural resources. This ideal situation is what we called “complete 3R loop”.



Figure 2. The Complete 3R Loop Cycle

Product and materials used in interior are called “green” when they do not contribute to indoor air pollution, which means they do not compromise to the health of the occupants, and at the same time, their production processes, useful life, and disposal cause as little damage to the global environment as possible (Pilatowicz, 1995: 95). Green design is an element of sustainable design. Green design powered by sustainable energies is sustainable design. Sustainable design improves the quality of life while eliminating the need for non-renewable energy (Williams, 2007: 16 - 17). This condition may be achieved by, one of many steps, apply 3R movement.

As we know, human beings are part of the nature; all changes to nature and to habitat have an impact on us (Williams, 2007: xxi). Pollution and over nature exploitation is the consequence of bad design which may cause harm to our living (as shown in figure 3). Therefore, Indonesia as developing country, which have significant role, has made a regulation about waste management in “Undang-Undang Pengelolaan Sampah no. 18 tahun 2008” (“Waste Management Regulation no. 18 year 2008”). In this regulation the government cooperate with community and industry as environment sustainability is our responsibility not merely partial responsibility.

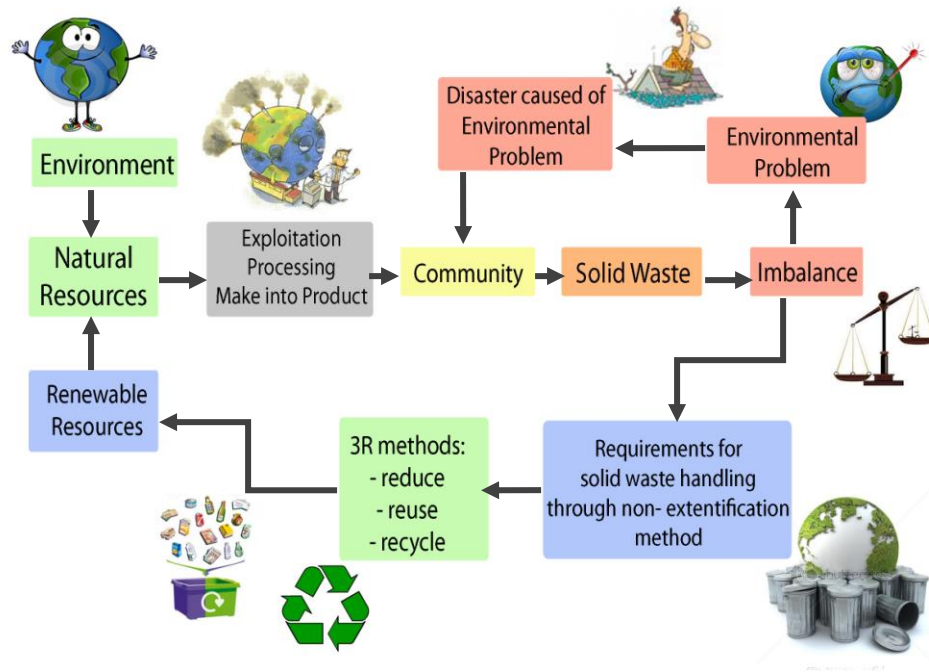


Figure 3. Indonesia's Waste Management Cycle (simplified – for community impact)

As an appreciation and stimulation to the society to take part in this waste management program, Indonesia government have Adipura Programme. This program will give a trophy as an appreciation for the best waste management province and individuals who are reckon to be environmental heroes by doing 3R movement. Some of 3R that has been done in Indonesia, and has become a trend few years ago in furniture and interior world, is the use of eceng gondok plant in furniture. Lately, the use of used cardboard as an alternative material already emerges because of its easiness to form and large possibilities to creating forms. This is where designers role take part, not only to create but also to educate the society about 3R movement, green design, and alternative materials.

4. CARDBOARD EXPERIMENT AS ALTERNATIVE MATERIAL

The awareness of global market and entrepreneurship are increase significantly since 2005 in Indonesia, specifically in Surabaya. The needs to introduce products to the market increase significantly in form of doing exhibition using interactive booths. This phenomenon causing the raise of exhibition hall built in Surabaya to accommodate this needs.

Each month, 20-30 exhibitions held in exhibition area in 1 mall in Surabaya which last from 3-4 days until 2 weeks or more. Each exhibition may have 8 – 20 or more participants who need attractive booths to attract more customers. This

data may exclude those booths in the same mall that stand alone in an empty area for a promo session. The demands of these attractive booths, however, need to meet some qualification such as the ease, the speed, the timeliness in design process, material processing, installation, to dismantling. To cover these requirements, cardboard can be used as an alternative material that meets those time and easiness requirements, yet environmental friendly as well.

To make a booth or furniture from used cardboard, we need to make sure that cardboard used are thick enough, stiff, dry, and have no contaminant. Corrugated box that recommended are boxes come from electronic gadget (such as TV, refrigerator, and washing machines), musical instrument, furniture shipping, and cigarettes. Those corrugated boxes may be useful to make furniture, but when it came to make high or extremely long products (such as booth gate) we need to use raw cardboard (cardboard that haven't processed to become a box).

Cardboard taken from corrugated box come in huge variation of size depends on where it came from. The bigger the thing it covers, the bigger the cardboard size we will have. But raw cardboard, have more flexible size since it still comes in roll. Raw cardboard width is 1.22 metre with unlimited length and various thicknesses (the thickest is 1 cm). But it is recommended to refer the size of plywood (1.22 x 2.44 m) cut size to avoid bent in the product.

Here is an example of cardboard furniture making came from Petra Christian University Students, Department of Interior Design, class of 2007:

1. Draw a pattern on the cardboard and cut it. To achieve certain thickness, we need to pile up and stick some layers of cardboard. Repeat this step until we have certain thickness we want.
2. Glue the cardboards layer to each other. If we wish to give colour to our product, cover the outer side of the layer with the glue as well. Glue used is white glue. This glue layer is intended to prevent the paint seep into the cardboard, thus make the colour to fade. Give only 1 layer of glue.



Figure 4. White Glue Layer on Cardboard

3. Series the cardboard pieces and unite them by sewing each pieces.

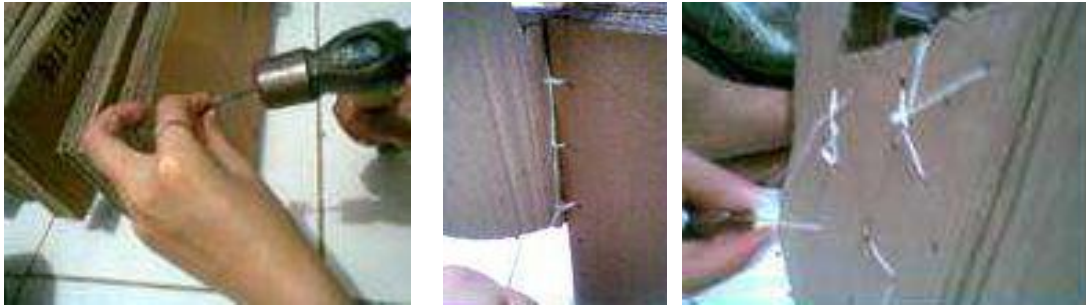


Figure 5. Sew Each Part of Cardboard

4. For perpendicular fittings, connect each other by gluing each section. But making wood-like construction is possible (like Dowell fitting for example, so the product can be knocked down).



Figure 6. Perpendicular Glued Section

5. Paint the cardboard furniture with water based paint to decrease the indoor air pollution. Paint the pattern we want over the base color.



Figure 7. Paint the Product

6. To avoid faded paint, we may cover the outer layer with glossy sealer. The cardboard furniture can be used already.

Cardboard furniture acceptable weights depend on its thickness and stiffness. These 2 factors also affect furniture's stability and balance beside its design. 3 cm cardboard layer thickness may accept weight until 80-85 kg with stable seating position, while 5 cm cardboard layer thickness may accept 90-100 kg. But, thicker cardboard layer bring some disadvantages which are it became harder to sew (which may decrease design probability and

construction) and immobile because of its weight. Cardboard furniture has good durability. These chair used as examples are already used for more than 2 years with no significant damage.



Figure 8. 5 cm Cardboard Layer Thick. Designed by Erlene



Figure 9. 3 cm Cardboard Layer Thick. Designed by Ferry Gunawan

Construction used and fitting system for cardboard furniture and booth can be various. Some constructions that commonly used are:

Table 1. Cardboard Construction and Its Advantages and Disadvantages

Construction	Advantages	Disadvantages
Pile up and glue	<ul style="list-style-type: none"> • Easy to conduct • The simplest • Neat look without construction exposed • Applicable for extreme length or width 	<ul style="list-style-type: none"> • Causing more indoor air pollution • Cardboard used will not be able to be separated • Less recyclable
Pile up and sew	<ul style="list-style-type: none"> • Neat look for construction exposed • Stronger and more stable than glued • Bring possibilities to fold the product 	<ul style="list-style-type: none"> • Extreme neat required • Hard to conduct in thick layers
Brick series	<ul style="list-style-type: none"> • Flexible in design • Can be used easily for other use • Easy to store and keep 	<ul style="list-style-type: none"> • Inefficient in installation an dismantling



Figure 10. Cardboard Booth in Pile Up and Glue Construction, Designed by: Skyline



Figure 11. Cardboard Furniture Which May Use Sewing Construction, Designed by: Arkitektur & Design



Figure 12. Cardboard Booth in Brick Series Construction, Designed by: Fat Brain Toy Co.

5. CONCLUSION

Industrial product shall meet economical values. They cannot be over high economically so they can still be accepted by the market. Economy basic principal to use the lowest source, but to get the highest result, cannot be forgotten. Used cardboard definitely meet this requirement.

By using cardboard as alternative materials, we can save time, money, and natural resources. Used cardboard furniture and booth are faster and easy to make with simple tools. This take an effect to save money because used cardboard furniture and booth will decrease manpower used and electrical energy needed during the making process. Used and raw cardboard are cheaper than plywood up to 50%. Moreover, when we use cardboard as material, we wish to expose the unique of it so it will decrease finishing material spent. Less use of finishing, such as duco and laminate, may cause less indoor air pollution.

The decrease of man power, electrical energy, plywood used, and finishing material means the increase in saving natural resources. This alternative material may also decrease unused material around us. By having all those advantages, used cardboard can be said as an environmental friendly alternative material.

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