

A Review on Up-Cycle Plastic Waste Material: Current Body of Literature, Knowledge Gaps Furniture Design Base from Designer Perception and User Response

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Abstract — Understanding the characteristic design should be an emotion's role in various aspect of design, not only represent the goal of this research, but also the successfulness of any design that have good characteristic will success in the market. Some scholar has regarded the design characteristic as a main tool that all designer use and understand to deliver the product message and feeling that connect to the user feeling and emotion. This research project will propose the design and prototyping from up-cycle material to create furniture design in order to investigate from designers and the user response in developing design characteristic into the new upcycle furniture design. The wastes from the manufacturing process are harm to our health and environments and the pollution become a big major issue in Malaysia. However, by upcycling the materials or products to create another creative object could reduce the pollution issue and in the same time support the awareness sustainability campaign. This research will focus on user oriented in order to identify the use of upcycle material can play a role developing solutions for interesting and interactive furniture design by inserted the good characteristic in it. The motivation needs of user are often not researched, addressed, and misunderstand in developing the design idea. Therefore, an underlying objective of this research understudy is to investigate and develop design characteristic which illicit favorable responses from designer and user's opinion in their response and experience. The responses in the form of perceptions, opinions and those aspects resulting from in-depth observations of furniture design that derive from up-cycle material will be researched in this study. This is to understand the needs of designer and users and to contribute guidelines for the future development of up-cycle furniture design.

Keywords - design characteristic; up-cycle material; furniture design; designer; user response.

1. Introduction

This research will focus on user oriented in order to identify the use of up-cycle waste plastic material can play a role developing solutions for interesting and interactive furniture design. The motivation needs of user are often not researched, addressed, and misunderstand. Few literatures have been dictated on up-cycle furniture design. There are many examples, which demonstrate the limitations of inadequate planning and design of user-centered of up-cycle furniture design in this Malaysia. As explained by Siu (2003) in his research: "most designers are dealing with design problems that related to the "user interest," such as in selected environment and the furniture installed in it, tend to set up restrictive standards that may not meet the actual preferences and user's need". He also added, so many designs that related to the user interest are generally difficult to alter. Different case for the individual uses in product design, public space users have no much choice in selecting the appropriate product and mostly in common they have no choice. Rather than foster "one-size-fits-all" design on users, designers who especially generate design for user should re-design their task and put themselves as facilitator to create flexibility and opportunity for users to actualize designs and participate in process of decision-making. In this research, it will discuss about the potential of both parties, designers and user to take part in developing the design characteristic for the new furniture design by using up-cycle waste plastic material as the main material.

1.1. Up-cycle Definition

The upcycle concept can be defined as reuse of waste product or material to build another creative object to solve the current linear system of 'take-make-dispose' economy which generating enormous volume of waste. The term up-cycle was officially use by William Mc Donough and Michael Braungart (2002) and they solidified the definition of upcycle as a simple real- world method of preventing waste through the everyday recycling of an old product into new ones. The terms of upcycle are often confused with down cycling, which similar in nature but it's different in result. In current linear system of "take-make-dispose" economy is generating the enormous of volume waste and depleting the environmental pollution and the apparent solution to this issue is to reduce-reuse and recycle. By referring to Radosław Maćik and Monika Nalewaje (2013) they explain that yet another motive interest in the product reuse is the desire or needs to look for useful solutions that simplify and can organize something's. In this part, it will conserve not only money but also time and effort. The phrase that can define the upcycle is the "creative reuse of waste" because it developed from the human creativity in creating an attractive object, base from the any waste material. According to Mridula Harihar (2015) he stated that, by finding and exploring a new purpose of waste material by extending the waste lifespan by preventing it entering the landfill. Furthermore, the upcycle involving creates the new products by using the minimal input and no fuel. Some researcher argues about upcycle because its more on self-expression like an artwork and not out of a concern for the environment but the detail on the making and selecting the material plus the technique is the answer for the argument. Victor Papanek (1995) has mention that "When our designs are succinct statements of purpose, easy to understand, use, maintain and repair, long lasting, recyclable and benefit to the environment, we inform. If we design with harmony and balance in mind, working for the good of the weaker members of our society, we reform. Being willing to face the consequences of our design interventions, and accepting our social and moral responsibilities, we give form". With re-using and re- purposing any material resource natural or man-made addresses the above mentioned INFORM, REFORM and FORM in a simple and effective way.

1.2. Designer Role

By way of brief background explanation, Le Corbusier (1991) clearly demonstrated early modernist thinking about planning and design in physically human are same and the average size is easy to find and its help to contribute the standard functions, needs, objects and dimension. By putting all users in the same category of average, it is difficult what is the best and suit to them. He also claims that the task of planning and designing, have an active pressure to contribute the benefit of the modern age. It is apparent that Le Corbusier saw planners and designers as experts and, sometimes, as the only experts who could provide true order in work places. He built his ideal and ordered city, according to his very own physical construction, configuration, sense and social values. We may assume that Le Corbusier's modernist assumptions seem today to have been circumscribed by the limited perspectives of his own time, and some people have questioned the humanity of his concepts of planning and design. As reported by Siu (2003) most of designers are expecting that they know the user needs and predict their taste, in the same time produce an appropriate design for them. In brief, designers nowadays still find that their ability is limited by many unknowns and that generating design, especially designs for user's use to suit a wide range of users, is a very challenging task that is subject to many variables. Siu (2003) *ibid*, in his research has suggested that task of the designers cannot create the product that is the best as they had done but designing from the continuous of two-way communication with the end user because the power of designer imagination should appropriate with the level of awareness on design choices from the user. This indicated that the final design outcome should come from the exchanges between designers and users. The designers provide opinions, professional advice, and discuss the consequences of various alternatives, and users give their opinions, and contribute their practical experience. This is a more general conception that flows on from the principles of user-centred design. In the context at this study is not to devalue either professional designers or their designs. However, it should be noted that users expect and act differently in using furniture, and sometimes in opposition to designers' expectations and decisions. When current designs and plans of up-cycle furniture are reviewed, particularly those claimed to be designed and planned in the user interest, professional designers and public officials frequently employ various strategies to get users to follow the predetermined modes of practice. However, in converse statement the professional decides, and expectation are not always being following by the user exactly. Carteau's (1998) had responses at this situation by saying that, some group of people that can be categorize as poor and destitute people sometime are not following the policies given, defined and designed by the professionals and mostly they interact with produced design are commonly unpredictable.

1.3. A New Viewpoint on Designers' Roles

As mentioned above, some designers are recognizing the diversity of users' needs and wants. However, the question is, whether users' needs and wants can be satisfied without understanding how they operate. Therefore, this study proposes that we shift our attention from the designer and the design to the user. This shift of attention is not intended to undervalue design, since designers still need to play an important task. Nor does this shift of attention only mean recognizing the diversity of users' needs and wants. As suggested by Siu (2003), at first the designer should able define what they should, and they should not in making the decisions for the user. From this, it can be described that they should not demand their value judgments on users. Most of the manufacturer invests for the market research to understand the needs of the user with their preference to developing the new design and in the same time tested it extensively. In this context, this is same that most of the products design especially use in the environment such as furniture must deal with the user's need and desires. The serious consideration of the needs and preferences of different user groups, particularly those of the minority groups. In parallel with recognizing that, they should not and cannot make arbitrary decisions for users. Designers also should recognize that users have the right to actualize and modify designs to make them more suitable to their need and desires. Based on these recognitions, there are two alternatives, which designers should seriously consider: allowing more "space" for users to fill in and encourage users to take part in developing designs. According to Sanoff (1992), "We can categorize user participation in seven major forms: representation, questionnaires, regionalism, dialogue, alternative, co- decision, and self-decision. Representation is a form of design in which the designer represents the anonymous user through a personal and subjective interpretation of the user's situation".

1.4. Instrument in Measuring User Response

Semantic Differential (SD) is one of measuring instrument to obtain the connotative value of an object or an image. The SD is used to find out consumers' feelings about the product. The characteristics of the product design are identified from the consumer's image and feelings by studies or experiments in which the relations between words and design elements are observed. SD tries to explain which messages an express or represents. Most of SD research is intended to aid in understanding how human beings interpret the appearance, the use and the content of the product. The SD is a scaling tool, which has been used frequently for measuring social attitudes especially in the field of linguistics and social psychology and Osgood, Suci and Tannenbaum first devised it in 1957. Nowadays, it is widely used for "measuring the meaning of an object to an individual. The subject is asked to rate a given concept on a series of seven- point bipolar rating scales". Constructing bipolar scales based on semantic opposites, such as "beautiful - ugly", "angular - rounded", "high - low", "black - white", "wide - narrow" and so on. An example of an SD scale follows:

BEAUTIFUL 1 2 3 4 5 6 7 UGLY

This scale has the advantage that the subjects can indicate whether they judge the object to be extremely beautiful or ugly by marking the extremities (1 or 7, respectively) or they have not formed an opinion by marking position 4, a neutral position half way between the two extremes. Using semantic scales that are designed to capture the emotional impact of design allows the candidate to understand how the product is 'plotted' in emotional space. Other vital advantages of using SD is that it is easily implemented and is not a complicated concept for lay people to understand since the requirement is only for the subject to make some sort of judgment and circle a number.

Table 1: Six methods of UCD that had been selected.

UCD Methods	The Statement
Focus Group	It will involve the selected invited group or user to share their experience, feeling, behavior and perception.
Usability testing	It is a session where the designer evaluates by collecting data from selected user. User will be invited to test the usability of a product and will be asked to perform some requirement task to get some information of any problem encounter.

Observe users	Whenever possible, the design team should arrange a field study to observe how users currently work. This can provide an in depth understanding of the users' needs and working environment and provide a solid foundation for design. This information is often difficult or impossible to obtain by any other means.
Participatory design	Participatory design does not just ask users opinions on design issues, but actively involves them in the design and decision- making processes.
Questionnaires	Questionnaires are a means of asking users for their responses to a pre-defined set of questions and are a good way of generating statistical data.
Interviews	An interview usually involves one interviewer speaking to one participant at a time. The advantages of an interview are that a participant's unique point of view can be explored in detail. It is also the case that any misunderstandings between the interviewer and the participant are likely to be quickly identified and addressed. The output of an interview is almost exclusively non-statistical - it's critical that reports of interviews are <i>carefully analyzed by experienced practitioners</i> .

1.5. User-centred Design

User-centred design also known as UCD is a method that will be use in this project and there are 6 methods from UCD has been selected to achieve the successfulness of this research. It is an approach that involves user in the design development to make sure the key point of user needs will deliver. The 6 methods of UCD are: There are four essential activities in UCD project.

Table 2: Four essential activities in UCD project

Essential Activities	Activities statement.
Requirement Gathering	Understanding and specifying the context of use
Requirement Specification	Specifying the user an organizational requirement
Design	Producing design prototype
Evaluation	Carrying out user- based assessment of the project.

2. The Methodology

Methodology in design refers to the techniques and tools and assistance available to the designer to assist the research process. Green and Bonollo (2010) have emphasized that a design method usually describes models, principles, practices and procedures that contribute to the efficacy of the design process. The method(s) in design research may include methods related to the design process but, in general, it will also include qualitative and quantitative methods where empirical data obtained from interviews and field observations is processed, with appropriate software, in order to extract important concepts, principles and guidelines that describe the social and cultural system being investigated. Furniture design is a problem solving and information processing activity where the objective is to develop a successful design fitting the needs of consumers. To achieve this objective, in the first stage of this study, the writer will employ a systematic, qualitative research method based on data collection, analysis, synthesis and decision-making by interview designers and peers. Specifically, this method will use the semantic differential style of question by interview with designers and peers to gain data in developing first prototype. In the second stage of this field work, direct observation of people, combined with some open-ended interviews, in keeping with ethical guidelines, will be carried out in the noted of selection question regarding their response through new develop furniture design.

The preselected subject responses will provide qualitative data, which will be analyzed for detailed insights into individuals' beliefs, experiences and perceptions. Later, in the third stage of this fieldwork, two working prototypes of upcycled furniture design will be fabricated and placed in the selected areas in order to obtain direct (through short Likert scale SD questionnaires) and indirect (through discreet observations respecting the privacy

of the subjects observed) responses from users – again, using the method adopted in the first stage above.

3. Conclusion

For the conclusion, in developing the design characteristic for the new furniture design based from up-cycled waste plastic material that require the ideas from designers and user is important. This is because the user as the target prospects will plays a role as idea contributor in developing the new design characteristic for the new furniture design and the designer is the creative players who will gain the information of the user needs and assemble it together to propose the new design. In this research project the important of this level is a must because of the using of the up-cycle plastic waste as main material is the new innovation in Malaysia. The user point of view in contributing the ideas of user's need is a very important part to tackle their attraction and preference. Combination of the designer's creative idea in creating the best design that reflect the user's need will establish the new design that have the sophisticated design characteristic that have its own standards in furniture design market.

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