



Modern Design and Cognitive Neuroscience: Impact of Cognitive Theory on Green Package Design

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ABSTRACT

Package also has a life cycle. Regenerative design as green package just focuses on every part about its continuity of the life cycles in the design. This paper integrates the cognitive and design theories that underlie the realistic design by experiment and field investigation. The purpose is to blend human perceptions, emotions and other elements into physical packages in order to render more comprehensive design functions and methodologies. Human is not only a dominant power but also the key controlled factor in the package design process. Only when people accept the green package from their hearts can the true green design be realized. In this way, the package regeneration path would last forever.

Key Words: Cognitive Neuroscience, Modern Design, Green Package Design

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Introduction

In the field of cognitive psychology, package design is such a medium that conveys commodity information as a type of visual communication carrier; it is the consumer's response to the product in terms of cognition and emotion (Orsucci, 2006). Audiences capture information about two things from each product, i.e. the product functions, which are the most essential and immediate material information, and also an important property that attracts most people to buy goods; the commodity package, which is designed to convey the intrinsic, indirect and non-material information, also as the other property that appeals to customers. In the immaterial society, the core design has involved far more than the basic functions of package. People have started to regard the commodity package as a culture and cognitive process.

Solid waste pollution refers to soil contamination caused by toxic or non-degradable packages in this way that their ink toxins and plastic residues enter the soil after they are

discarded and slowly diffuse to an extent (Anderson, 2006). The composition of solid waste is shown in Figure 1. It is thus clear that the three major pollution sources are nothing less than food package waste, construction waste and plastics. Unsustainable package is exacerbating everything like this (Mesulam, 2006).

Not only will packaging material cause pollution, but also a lot of wastes generated in production will do so as well. As each process in production requires huge amount of energy, the energy combustion releases massive pollutants that have caused countless problems about human health. According to the statistics from the World Health Organization in 2002, about 300,000 cases have died of air pollution, but among them, only one-third died of car accidents. And worse, the raw materials for many packages are derived from forests, such as the previously mentioned papers (Reuter-Lorenz *et al.*, 2008), and woods that are directly used to make packages, all of which directly results in the depletion of forest resources. From the

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perspective of energy loss, the most fundamental part of package that causes environmental issues is the package life cycle. However, ironically, consumers often do not require or want such package designs that won't cause environmental issues. The most direct manifestation of climate change caused by package material contamination is global warming. Additionally, a special issues we often ignored (Bailet *et al.*, 2008) is the social contradictions behind pollution. Many third countries have had a lot of negative impacts produced during construction of industrial facilities and the extraction of raw materials, including environmental pollution, even various corruption phenomena (Noble *et al.*, 2008), so that the term "resource curse" emerges.

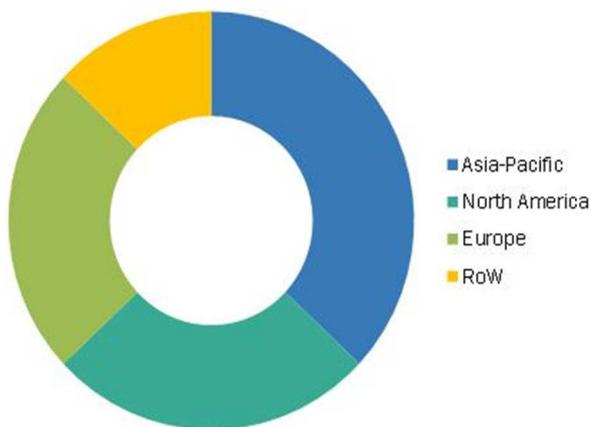


Figure 1. Green Packaging's market share in all continents

Package design based on Cognitive Theory

Consumers' cognition of commodity package and guiding design using cognitive law

Cognitive psychology studies how people perceive, learn, remember, and think about questions. The core of cognitive theory is to regard consumer behavior as a process of information treatment. From the time when consumers receive commodity information to the end of the final purchase behavior, it has a direct bearing on the processing and treatment of information as the process that the consumers receive the code, extract and use commodity information. According to cognitive theory it can help get more from less when guiding package design, as shown in Figure 2.

Sharp traders often make packages different in order to make sure they quickly appeal to consumers. On the shelves of supermarkets, as ordinary packages impress the consumer by only 1/10 second, ample sensory

stimuli are required to make package attract consumers' attention in every regard, i.e. name, shape, color, logo and font print (Butterworth *et al.*, 2006).

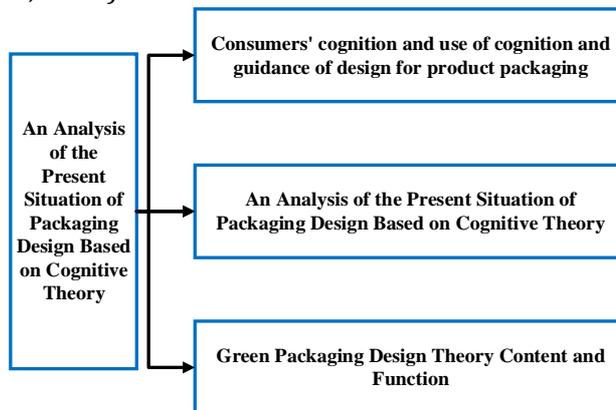


Figure 2. An analysis of the present situation of packaging design based on cognitive theory

Sensory stimuli include absolute thresholds and differential thresholds. The former refers to the minimum stimuli level of sensation produced by the individual who can perceive the difference between "some" and "none" as the absolute threshold of that stimuli. On this basis, packaging designers strive to measure the absolute threshold of consumers in order to make sure that their new products can be designed to be more conspicuous on the shelves than that of other competitors. The latter means the minimum difference that can be perceived between two similar stimuli. In the 19th century, German scientist Weber discovered that the difference threshold between two stimuli is not absolute, but its magnitude has a concern with previous stimuli intensity. The well-known Weber's Law states that the stronger the previous stimulus, the greater the intensity of the stimulus required to perceive its difference from the second stimulus (Anderson, 2006). In order to make the package design more conspicuous among the consumers at a low cost, they should just fall above the differential threshold.

Designers often want to update their current package designs without prejudice to the consumers' identity accumulated under influence of advertisement over the years. In this regard, they often make minor changes that are elaborated below the differential threshold so that consumers can only perceive delicate differences. For example, Pepsi redesigned the package and updated its logo in 1997. Its new can is a bright cadet blue named Pepsi in white letters just in



right above. In order to provide continuous perception characteristics, the company introduced the new package in a brighter blue, and gradually tinted the blue to make the logo more prominent.

Status analysis of package design based on cognitive theory

With the development of society, what's needed now is no longer the expansion of basic functions and quantity, people turns to chase their emotions, tastes and other spiritual satisfaction instead. Designers should comprehensively grasp the information about the commodity, discover and define the expected targets, visualize them and blend them into the packages. What they have expected is correctly presented and interpreted by the consumers, then the package will achieve its due function. Now in real life, however, some consumers have a weak awareness of green consumption, and worse, excessive packages, false packages, and white pollution, etc. emerge in an endless stream (Chang *et al.*, 2008). The excessive consumption of resources and the contamination of package waste are more detrimental to the ecological balance, and further cause great environmental issues.

During large-to-medium-sized publicity and survey activities in the 16 districts of Beijing, 16.99% of the interviewees made the first choice of the "package waste pollutant" when they were asked what are "the most important environmental issues that impact people's work and life". When referring to "whether there are excessive packages of goods", 73.64% of respondents believed that there are, which suggests that the package waste has become a source of urban pollution that should arouse people's wide concern. Such concerns also herald that people show a little awareness and philosophy of environmental pollution issues caused by consumer activities. The objective conditions for green consumption consciousness and concepts are increasingly available. The concepts of consumers tend to be more rationalized. Consumers' emphasis on the product essence and demands for package moderation have laid a good foundation for the development of green consumption. In order to stimulate the development of green package design, for consumers, how to maximize the consumers' awareness of green consumption; improve the consumers' concept of green consumption, all of

these can be reflected in advertisement and package design (Kodituwakku, 2006).

Essence and function of green package design theory

Green package, also known as the Environment friendly package or ecological package, refers to those packages that are not detrimental to the environment and human health, and can be recycled and regenerated. It is a systematic project that involves knowledge in many fields such as containers, packaging materials, packager design, production processes, and waste disposal technologies, as the trend of packaging discipline and also the sustainable development path of China's package industry. The functions of green package can be reflected in the following aspects:

1) Green package effectively relieves resource crisis and pollution prevention; 2) Green design integrates the ecology theory into the package system concept to facilitate the solutions to environmental issues; 3) The use of green package can help China's firms strengthen the awareness of environmental protection, increase their exports and earn foreign exchange, improve the economic efficiency of businesses. More of that, Europe and the United States and other countries have laid down relevant laws and regulations and established the "Green package system" in accordance with their domestic resource conditions, consumer preferences and other factors" (Van *et al.*, 2008).

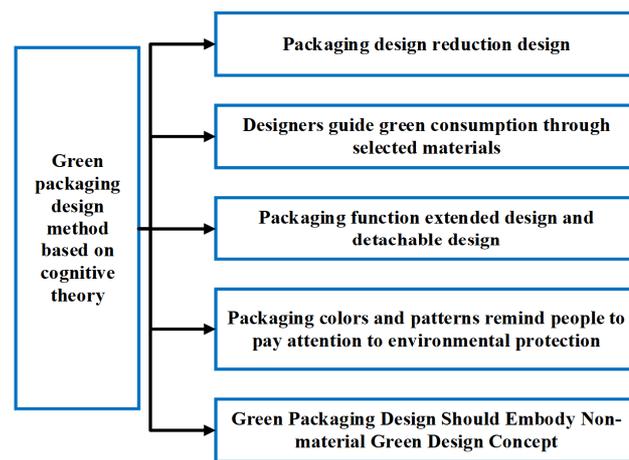


Figure 3. Green packaging design method based on cognitive theory

Green package design based on cognitive theory

Table 1. Self-reference effect experiment participants recalled results

	Team 1	Team 2	Team 3	Team 4	Team 5
Accuracy in first time	25%	30%	25%	60%	65%
Accuracy in second time	50%	70%	60%	70%	76%
Accuracy in third time	70%	90%	80%	80%	89%

Table 2. Forgotten curve experiment participants recalled results

	Team 1	Team 2	Team 3	Team 4	Team 5
After half one hour	3	5	4	8	6
After two hours	2	5	3	7	5
After four hours	1	3	2	5	4

Minimize package modeling composition design, innovate from a modest perspective and reduce the space fraction of package

The green package modeling composition design should recur the simple idea, the most provincial material and sophisticated shape, the simplest text and convey more accurate information. The space fraction refers to the ratio of the space volume exclusive of product volume to the bale capacity, as shown in Figure 3.

Designers leads green consumption with selected materials

In package design, we should expand the mindscape and lead consumers to involvement in green consumption. The memory of different experimental subjects for various package designs is shown in Table 1. Designers use different materials to convey the green design concept in order to let them get closer to people's lives. Some "recycled papers", "recycled pulps", "reprocessed plastics", "regenerated glasses" and other materials should be effectively reused. During selection of materials, the principles of minimization, simplification, lightweight and toxic-free harmlessness should be followed.

Package function extension and detachability designs

The extension of package functions refers to the recovery and reclamation of package wastes, i.e. their ecological cycle. For some enterprises, such extension can not only create considerable economic benefits, but also produce good environmental benefits.

Packages that require composite materials should be designed as a detachable structure that facilitates recycling after disassembly. The green design targets at the prolonged service life of the product to perform an innovative design on assembly structure of the exchangeable component, makes it possible to disassemble

most of the components, thereby increasing the service life of the product.

Remind people to pay attention to environmental protection from the package colors and patterns and create a good market atmosphere for green package.

We should underline and propaganda information about environmental protection, create a visual perception of green package among patterns, names, colors, and characters, eliminate unwanted decorations while giving consideration to the features. From the visual sense of packages, people's awareness of green packages should be improved, thereby accelerating the development of green package design field. Psychology studies have suggested that, when a human visual organ observes an object, color perception dominates by 80% within the first 20 seconds, and physical perception by 20%. After another two minutes, color gets 60%, physical sense hikes up to 40%, and after more five minutes each changes half. It is proved that colors can make products stand out from the competition of similar commodities. The recall results of experiment subjects in forgetting curve are shown in Table 2.

The green package design requires that the graphic design should reflect the non-material green design concept

That is to say, consider from human factors, it should reflect the "people-oriented" design concept and cater for the demands of consumers to the greatest extent. It also focuses on elderly people and those with dyschromasia. For example: humanized colors can help those elderly people with cataract distinguish between colors, such as using bright red or pink to match the blue-green, the design often uses bright colors and black with distinct light and shade tints.



Conclusions

A string of experiments and surveys integrate the cognitive principles and design elements, and it is concluded that some practical cognitive principles are applied to specific designs, such as the schema and impression management theory is used to investigate the image of recycled materials, so that we learn what are opinions and preferences people show on different regenerated materials. On the principle of cognitive dissonance theory, an experiment is conducted on the regenerative package to explore how to reduce cognitive contradictions. In the end, the conclusions from these experiments are integrated to pick out two specific green package regeneration designs, i.e. the emotional design of appearance and function, and the life cycle design of materials and structures. Appearance and functions can waken people's emotions on the packages, thus making people tend to choose and use green packages and persist in this behavior. Materials and structure ensure the recyclable nature of the package itself and enable the integrity and continuation of its life cycle. These two design concepts highlight the characteristics of the people who are both the package designer and the package user.

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