

Influence of Packaging Design on Littering Behavior

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ABSTRACT

Litter is an environmental and social problem that is closely related to packaging. Many attempts have been made to reduce litter. So far these attempts have mainly focused on influencing littering behavior either through general campaigns or through manipulating the environment. The latter might be done through strategic placement of prompts and litter bins and through cleaning up any previous litter. So far, little or no attention has been paid to the influence of the littered object itself. This paper proposes that the design of a packaging influences the changes of it being littered. Two empirical studies will be presented that support this proposition. Both studies were performed in a university cafeteria. The first study looks at placing anti-litter labels on packaging, comparable to health warnings on cigarettes. This study was performed using single-use coffee cups. The presence of the label reduced litter significantly. The second study looked at the influence of reclosability of soft-drink packaging. The study compared a PET bottle with a carton packaging with a tear-off closure. The PET bottle resulted in significantly less litter.

INTRODUCTION

Littering is a social and environmental problem. It is perceived as untidy by most people and can be harmful to the health of humans and wildlife. Yearly communities spend substantial amounts of money on cleaning up litter. Hence reduction of litter has received a lot of attention, both from scientists and governments. In this paper the following definition of litter is used: *'Those forms of trash that either originate by people throwing away or leaving behind artifacts they consider functionless in places not officially intended or designated for such a purpose, or that end up in such places by indirect action or inaction of people.'* (translated from Terpstra et al., 1979). Trash is here taken to mean items for which the proper way of disposal would be to put them in a trash receptacle, like an ashtray or a waste bin. With this limitation it is possible to distinguish some major sub-categories of litter by their nature and how people acquired it, namely:

- packaging materials and disposables such as coffee cups and napkins
- leaflets and handbills (i.e. information carriers) and
- product remains, such as cigarette butts and fruit peelings.

The different strategies for minimizing litter, that have been applied in practice, will be discussed. These strategies can be divided into antecedent strategies and consequence strategies, occurring either before or after the act of littering respectively. Antecedent strategies that have been applied are related to factors that have been found to be relevant in literature. Firstly, litter already present in a certain location is found a relevant factor, i.e. litter begets litter (for a review of literature see Curnow et. al. 1997, p.31). A second strategy is aimed at the trash receptacles. Attempts are made to reduce litter by reconsidering the number, the design and the placement of trash receptacles (for a review of literature see Curnow et. al. 1997, p.34). A third antecedent strategy is communication. In general, this strategy is the most widely studied approach in littering literature, as noticed by Stern and Oskamp (1991, p. 1055-1057) in their review of the literature. This communications strategy can take several forms. Firstly there is direct communication on a site in the form of prompts. Many studies have been performed on the phrasing of such signage. Hansmann and Scholz (2003) give a review of research concerning the effective design of explicit anti-littering messages. They found evidence that prompts phrased as requests work better than those phrased as orders. Furthermore prompts are more effective if they contain a more specific description of the desired behavior. Next to that, there are more general public campaigns, such as the Keep Britain Tidy campaign (www.encams.com). Many countries around the world have similar campaigns that are on a city or national level. However, doubts have been raised as to the effectiveness of such campaigns (e.g. Kraus et al. 1996, p. 288). A final strategy is that of educational programs which have been designed for use at schools.

Next to these antecedent strategies there are consequence strategies which take effect after the act of littering or non-littering. These are either rewards or punishments. Punishment usually is in the form of fines. Even though most countries have laws against littering, these laws usually are not actively enforced. As the risk of littering, which is determined by the chance of a fine and its subsequent amount, is limited no real effect can be expected. That a system of fines can be effective is shown by Singapore where legislation is very strict and fines for littering can be as high as 1000 dollars, resulting in very clean streets. Yet, most local authorities consider this to be too much of an authoritarian approach.

Instead of punishing, several reward systems have been tried, such as lotteries. These have shown effect for the specific packaging related to the reward, but no long-lasting effects have been measured. For a discussion see Stern and Oskamp (1991, p. 1056).

An act of littering can be described by three aspects; the environment, the littered item and the litterer. As said the environment and the litterer have been subject to numerous studies. Remarkably though, the influence of the littered object has been widely neglected. Literature presents but few examples of studies related to the influence of the littered object. One of these examples is presented by Kraus et al. (1996, p. 277), who studied the influence of the size of handbills, but found no significant influence. The only aspect of the littered object that has received considerable attention is the difference in littering of cigarette butts and other types of litter (e.g. Cialdini, et. al., 1990). Yet, it is not difficult to imagine that several aspects of the littered object influence the actions of the person using it. Or as Williams et al. (1997, p. 56) found: '*... many people consistently littered some objects but binned others. Cigarettes, organic items, and very small objects were more likely to be littered than other objects. The type of object and the way in which the person perceives that object once its initial use has been completed has an impact on how they dispose of it. For example PET bottles tended to be reused and carried by many people while food wrappers – particularly once they were wet – often became messy and were disposed of quickly.*' What is proposed in this paper is that the characteristics, i.e. the design, of the littered object has a significant influence on the chances of it being littered. This means the packaging designer could use his design to influence the littering behavior of the users of his product.

The notion of influencing people towards more sustainable behavior through design is not new. Jelsma and Knot (2002), discuss the concept of product scripts, which they define as '*... a product layout guiding the behavior of the user, in a more or less forceful way, to comply with values and intentions inscribed into the product by its designer.*' In the field of litter prevention the concept of influencing behavior through design has been applied to the design and placement of trash receptacles by De Kort et al. (2004), who call it norm-activating design. Through design of trash receptacles they reminded people of socially desirable behavior. As De Kort et al. state, there are two options for norm-activation; explicitly through prompts or implicitly through design characteristics. It stands to reason that if this approach is effective for trash receptacles, it will also apply to the design of the littered items. Of the three sub-categories of litter mentioned before only the packaging materials and disposables are designed, or to be more precise, have a true potential for design change.

To approach this problem a first phase of the project focused on formulating packaging design guidelines that were thought to have an influence on the user's littering behavior. In the end 15 guidelines were developed (Wever, et al., 2006). The guidelines were: 1. Provide clear indications for proper use (use cues). 2. Prevent closures coming loose from the package. 3. Treat each separately packed sub-unit as if it were a single package. 4. Try to give the package a second function after use. 5. Put a label on the package that states decomposition time. 6. Give the package an appearance of higher value. 7. Make the user more aware of the package. 8. Design the package in such a way that it can be re-closed and carried along. 9. Give the package more volume and stiffness. 10. Design a package that keeps the user occupied. 11. Design a package that contributes positively to the user's image. 12. Design the pocketing of the packaging to be a ritual. 13. Assure free use of hands as much as possible while using the package. 14. Design a package that can be put away compactly and cleanly. 15. Design the package to function as a trash bin for products remains.

These guidelines were based on theory and common sense, and hence have no empirical backing yet. This paper reports on two subsequent empirical research projects conducted to verify the validity of these guidelines. It should be noted here that not all guidelines are applicable to all types of littering behavior. For a more detailed discussion is referred to Wever, et al. (2006).

STUDY 1: ANTI-LITTERING LABELS

The first study performed was to test one of the more straightforward guidelines, namely the placement of a label with the decomposition time. This guideline was based on the idea that lack of knowledge can prevent socially acceptable behavior. Even though the effect of providing knowledge is often overestimated by authorities, it can be effective for a part of the population (Nelissen & Kok, 1991). This guideline is aimed at the littering behavior of the 90% litterer (Curnow and Spehr, 2001). These are people that would normally dispose of

their trash correctly, but might not do so if they have the (incorrect) believe that something will decompose quickly anyway (fruit peelings), or is too small to bother (cigarette butt).

The execution of littering research is difficult. Even though there seems to be a lot of litter, acts of littering are relatively scarce and often performed in secret. Hence observing fully natural littering behavior is very difficult. Therefore concessions were made to create an operable research set-up. The research was performed in the building of Industrial design Engineering (IDE). It contains a large central space that contains the canteen and workspaces for students. It has two advantages, the first being that a lot of littering occurs in the building, making measurements easier, the second being the relatively closed environment for the experiment, letting only a small number of products leak out. The obvious disadvantage is that litter left behind in a building does not remain there long enough to decompose, yet the littering behavior is still closely linked to the 90% litterer, because of the belief of the litterer that something left behind will soon be cleaned by some staff member.

For the execution of the experiment several products were considered that were being introduced into this environment anyway. Criteria for the selection of a product were the number of products introduced on a normal day and the ease with which a label could be applied. Furthermore it was necessary to ensure that it was a product that could not be brought into the building in a different way than through the selected outlet, otherwise this would endanger the reliability of the experiment. Based on these requirements the coffee cups from the coffee bar were selected.

A label had to be designed to address the littering of these cups. The design of the label had to be clear and distinctive. On many current packages there already is a relatively small symbol indicating that the package should be binned. This symbol is clearly too small to have a strong norm-activating effect. Therefore, labels on cigarette packages were taken as an example, as they are known to be noticed. The text that was used was "Throw this cup in the litter bin, otherwise it will still be here 6 months from now...". Figure 1 shows a coffee cup with the label applied (in Dutch), Figure 2 shows a label with the translated label.

Measurements were performed during the weeks before Christmas, first without the labels, then with the labels. In the first weeks of the new year an additional measurement was performed to test the lasting effect of the labels.

RESULTS AND DISCUSSION

The canteen service does not collect data on the number of cups sold. The only data available was the number of clients at the coffee bar. As the idea behind the research set-up was to not let people be aware they are in an experiment, direct observation to count the number of cups was not an option. Hence 23 subsequent clients were observed to estimate the average number of cups sold per client. This average was 1.3. This method is not very exact, but the number of cups is only used to estimate the litter percentage. If it is assumed that the average number of cups sold per person is steady during the entire experiment, it should not affect the results. In the test before the application of the labels the litter percentage was 11,2%. With the labels applied this dropped to 6,71%. In the after test some weeks later the percentage had increased again to 14,1% (see Table 1).

Date	# of clients	# of cups (average 1.3 per client)	Littered cups	%
Without label Nov 29 - Dec 14	2430	3159	353	11,2
With label Dec 16 – 20	929	1207,7	81	6,71
Afterwards Jan 21 - 22	638	829,4	117	14,1
Total	3997	5196,1	551	10,6

Table 1: The number of littered cups counted.

To test whether the reduction is significant a χ^2 -test was performed. The reduction has a significance of 0.001. Unfortunately the labels do not seem to cause a memory effect. The test several weeks later showed that the litter percentage was back on the old level. However, this lack of lasting effect may be partly caused by the short period in which the labels were applied. Furthermore the effectiveness of the labels is subject to the wording and the design of the label. Obviously more research needs to be done to determine the optimal wording.

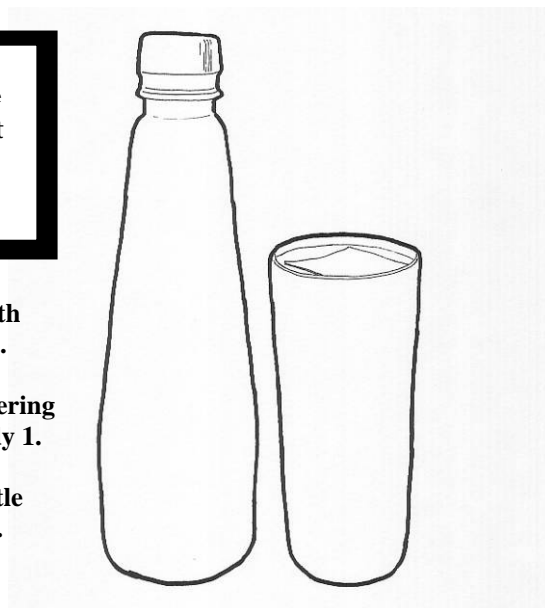


Throw this cup in the litter bin, otherwise it will still be here 6 months from now...

Fig. 1 (left): a coffee cup with label in Dutch from study 1.

Fig. 2 (above): The anti-littering label (translated) from study 1.

Fig. 3 (right): The PET bottle and Cartocan from study 2.



STUDY 2: RECLOSABILITY

A second study was performed comparing two package designs for the same product, that differed on several guidelines. The product that was selected was a soft drink. Criteria for this selection were the availability of multiple designs in the current market, the willingness of the manufacturer to sponsor the research by supplying the products, and the presence of the product in the canteen assortment. The latter point was important, as the products would be presented free of charge to people buying lunch at the canteen, as if it were a promotional campaign of the brand. This happened before with other products and therefore people would not be suspicious of the gift, and unaware that they were taking part in a littering experiment.

The packages that were selected were a 0.5 liter PET bottle and a 0.33 liter Cartocan, a cylindrical carton can with a tear-off closure (see figure 3). These packages differ on several guidelines. The bottle is reclosable, ensuring that the empty package does not leak. Hence people will be more likely to carry it along until they encounter a trash receptacle, as people are more likely to litter trash that is messy, or has a high risk of becoming messy (Williams et al. ,1997, p. 56) The reclosability automatically makes the bottle fulfill the guideline of providing a second function after use. People tend to re-use PET bottles for tap water (in countries where it is tasteful enough to drink). Furthermore, the guideline concerning closures coming loose from the package has some relevance. Both packages have closures that come loose, but the bottle cap is re-attachable whereas the tear-off closure of the Cartocan is not. Finally the PET bottle complies with the guideline on increased volume and stiffness. This guideline is specifically focusing on the type of littering behavior called wedging, forcing packaging into cracks and holes of public furniture during moments of boredom.

The experiment was conducted in the same setting as the first study. People buying lunch at the canteen were presented with a drink free of charge. 430 PET bottles were distributed the first day, and 394 Cartocan the day after. During the day and at the end of the afternoon the number of littered packages were counted in the central hall of the building and the adjacent educational rooms. Both entire packages and separate closures were counted.

RESULTS AND DISCUSSION

As was expected based on the guidelines the PET bottles were littered less than the Cartocans. Of the PET bottles 2,6% was littered, while 5,8% of the Cartocans was littered (see table 2). This has a significance of 0.05. In addition to this 16 of the tear-off closures of the Cartocan were found littered, while none of the caps of the PET bottle were found separate. If counting littered objects, this increases the significance to 0.001.

Package	# of packages	Littered packages	Littered loose closures	% of packages (packages + closures)
Cartocan	394	23	16	5,8 (9,9)
PET bottle	430	11	0	2,6 (2,6)
Total	824	34	16	4,1 (6,1)

Table 2: The number of littered packages counted.

CONCLUSIONS

The experiments have shown that different design solutions lead to different littering behavior. Significant reductions of littering were realized. The experiments provide an empirical basis for several guidelines.

The application of a clearly visible label concerning littering and decomposition time was found to have a significant effect. Also the combination of reclosability and a second function after use was found to yield a significant reduction in littering. Finally the number of loose tear-off closures from the Cartocan found, indicates the sensibility of the guideline against closures coming loose. However, observations during the experiment indicated that neither of the soft drink packages were found to be wedged, hence no conclusions can be drawn concerning the effectiveness of the guideline on volume and stiffness. Apparently it is not relevant for soft drink packages in this type of environment.

As with other anti-littering strategies the litter problem was not eliminated entirely. Hence litter reduction through packaging design should be seen as an addition to the tools available for reducing littering. Designers should realize the influence of their decisions on littering behavior, to enable them to balance this with the other functional requirements the packaging has to fulfill. To this end more research should be performed in establishing an empirical basis for all proposed guidelines.

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