

PREVENTION OF LITTERING THROUGH PACKAGING DESIGN: A SUPPORT TOOL FOR CONCEPT GENERATION

Renee Wever

Design for Sustainability Program
Delft University of technology
the Netherlands
r.wever@io.tudelft.nl

Niels Gutter

Sacha Silvester

Design for Sustainability Program
Delft University of technology
the Netherlands
s.silvester@io.tudelft.nl

ABSTRACT

Littering is a social and environmental problem. Numerous studies have been performed trying to understand littering behavior and to find ways to influence it successfully. Various litter-reduction strategies have been applied with changing success. These have either focused on directly influencing the attitudes of the litterer or on manipulating the environment in which the littering behavior takes place. So far, the influence of the littered object has been largely neglected. This paper proposes that the characteristics of an object are relevant for its chances of being littered, and that this chance can be influenced through design. This is particularly true for packaging. Based on factors identified in literature as relevant to littering behavior, guidelines have been developed for packaging design. As literature shows, litter is not caused by a single type of behavior. Each type of littering behavior requires its own design strategies to reduce it, therefore a tool has been developed to assist the package designer in selecting those guidelines most relevant to his or her current design problem. This tool has been developed and evaluated with people that work in the field of packaging. The purpose of the tool is twofold, first to demonstrate the potential of the approach, secondly to present industry with a handle of tackling this challenge. The tool will be the basis for further research in the future into the relation between packaging design and littering behavior.

KEYWORDS

Litter reduction, packaging design, idea generation, consumer littering behavior

1. 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. For instance, the organization charged with the maintenance of the Dutch highway system, spends 8 million euros yearly, in cleaning up road-side litter (Thijssen, 2002). Hence reduction of litter has received a lot of attention, both from scientists and governments. Numerous studies have been performed, studying the effects of different kind of litter reduction strategies. Sadly these studies have all used varying definitions on what litter is, mainly differing on what is included and what is excluded. Some researchers in the past have put minimum and maximum sizes on items to be considered as litter. This makes it difficult to combine the results from these studies (Curnow *et al.*, 1997).

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 astray 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:

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

1.1. Litter reduction experiences

Research related to litter has focused mainly on three points:

- on determining the amount, the compilation and the location of litter present in certain locations,
- behavior causing litter and
- the effectiveness of interventions meant to reduce litter.

A review of this literature will be given in chapter 2. First 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. Hence tidying a location by cleaning up any litter present will help prevent new litter. However, this is a costly solution that has a strong end-of-pipe character. 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. It is not necessarily the case that more trash receptacles reduce the amount of litter. An example of the opposite strategy can be found in a project done a national nature resort in the Netherlands, the *Hoge Veluwe*. Here all trash receptacles were removed and people entering the resort were handed special backpacks for trash collection. This strategy reduced littering by 10% (Nederland Schoon, 2002).

The design of trash receptacles has also been adapted. Here several sub-strategies are mentioned in literature. The design of the opening has been subject of study. Furthermore the conspicuousness of the trash receptacle has been researched, an example of which is given by Taylor (1985) who describes a bird shaped receptacle, and discusses its effective-

ness. Finally attempts have been made to make trash receptacles interactive. A successful example is to be found in the Dutch amusement park *de Efteling*. Here a trash receptacle was introduced in 1959 based on a character from a children's song called *Holle Bolle Gijs*, who was renowned for his appetite (see Figure 1). The statue has an open mouth on which suction is applied. A sound recording inside the statue calls out '*Papier hier*', which can be freely translated as 'Waste wanted'. After a piece of litter is placed in the mouth and sucked inside by a stream of air, the statue will say 'thank you'. This statue is so successful that children will even pick up litter to feed to it. This success may however be depended on the presence of children and the fact that the amusement park is not an environment where the same people come very often. Hence the newness of the statue is preserved.



Figure 1 Trash receptacle '*Holle Bolle Gijs*'. After a piece of litter is placed in the mouth it is sucked inside by a stream of air. A sound recording enhances the attractiveness of the receptacle

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. Yet, as they conclude at the end of their study, full scientific understanding has not yet been achieved. Hence '*...personal experience and intuition still have to be guiding factors in the design process of antilittering campaigns.*' 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 nonlittering. These are either rewards or punishments. The 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 height, 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). In principle the use of trash receptacles that give some kind of feedback when a piece of trash is put in, can also be seen as a reward, as with the example of *Holle Bolle Gijs* in the previous paragraph. A special kind of reward/punishment system is the introduction of

a deposit. This has been shown to be very effective for the packaging to which it is applied; yet running a deposit system costs a lot of money, possibly more than can be saved in clean up costs. Because of these costs beverage companies and retail chains are usually opposed to deposit systems.

1.2. Approach: (re)design of littered item

An act of littering can be described by three aspects; the environment, the littered item and the litterer. The environment, with its social settings, the availability of trash receptacles, the presence of other litter and the presence of prompts concerning littering behavior, has been studied extensively. Also the characteristics of 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 the few 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. 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 potential, though not seriously studied before, has been identified by several studies. As for instance Stern and Oskamp (1991, p. 1055) state: '*In terms of public-policy impact, the most important target behavior would probably be to influence manufacturers of consumer goods to use packaging materials that minimize littering and/or are biodegradable – an example of the 'prevention rather than cure' principle ... However, the antilittering campaigns described in*

the psychological literature have been aimed at influencing individual consumers' behavior.'

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. This paper reports on a project that attempts to improve packaging design to reduce littering. The project was inspired by an article in a Dutch legal document.

In the Netherlands the 'European Directive on Packaging and Packaging Waste' (European Union, 1994) has been implemented in the form of a covenant between government and industry. In December 2002 a third covenant (VROM, 2002) was signed, which will be in effect until the end of 2005. This third covenant contained for the first time a sub-covenant concerning the reduction of litter. Article 14 of this sub-covenant states: '*Industry undertakes to put into practice packaging innovations aimed at controlling and reducing litter.*' As the Dutch government threatens to introduce a deposit system on small plastic bottles and beverage cans if litter reduction is not achieved, the sub-covenant on littering has initiated a lot of activity from packaging industry. So far, their attempts focus on the communications strategy and the trash receptacle strategy. Little structured action has been taken on implementing article 14 of the sub-covenant. Industry seems to be somewhat at a loss as to how to approach this matter, as so little scientific data is available on the influence of packaging design on littering behavior.

2. LITERATURE SURVEY

As little specific literature is available on the relationship between packaging design and littering behavior, a more general review of litter related literature will be given, to see what leads can be found for packaging design. Several researchers have made and published reviews of the literature on littering. One of the most extensive reviews of literature identified is the study by Curnow *et al.* (1997), who reviewed close to 100 studies on littering behavior. As said, literature has focused on three aspects; the amount and composition of litter (this paragraph), the type of person that litters (§2.1), and finally littering behavior and how to influence it (§2.2 to §2.4).

In their review of literature (Curnow *et al.*, 1997) found that there is no consistency among studies on littering behavior concerning the used definitions of the terms 'litter' and 'litterer'. This has resulted in researchers using different ways of counting litter, excluding items that others included in their data, or vice versa. Furthermore the method of counting differed widely. Methods encountered where:

- Simply determining whether a site was littered or not,
- Counting items,
- Weighing litter found on a site,
- Estimating the percentage of ground covered,
- A combination of two of the above.

Hence, results from different studies consisting in part of litter counts, cannot be adequately compared. Furthermore Curnow *et al.* (1997) found that relatively few studies have been performed on littering behavior in 'natural' settings. Most research either consisted of questionnaires inquiring about behavior, or studied littering behavior in settings that were manipulated by the researchers by introducing items with increased litter potential, such as leaflets.

2.1. Socio-cultural factors

Curnow *et al.* (1997) also reviewed the literature on the influence of socio-cultural factors. They found some literature indicating that males are more likely to litter than females, but they found more literature that found no gender difference or that was inconclusive. The only gender related conclusion Curnow *et al.* found, that they trusted, was that males are more likely to recall and admit to littering behavior when interviewed. The literature on the influence of age was found even more inconclusive. Here Curnow *et al.* identified studies that found older people to litter

more than younger people, but also studies that found the opposite or that found no difference at all. Other socio-cultural factors have been researched to some extent, such as class, culture and even 'race'. Curnow *et al.* could find no consistent findings here. Few studies were found that addressed the influence of group size. Those studies that were identified showed two things. Firstly that people that were in pairs tend to display similar behavior, either both litter or both do not. Secondly people in larger groups were found to litter more than people in smaller groups.

2.2. Classification of behavior

There is not a single type of behavior causing litter. Literature describes several classifications of types of littering behavior. Sibley and Liu (2003) distinguish two types of littering behavior, namely active and passive (and active and passive non-littering for that matter). The difference is '...based on the latency between the placement of littering in the environment and the subsequent vacating of the area where litter was placed.' Active littering occurs when someone places litter while moving or at the moment they start moving. Passive littering is defined as placing litter while in a stationary situation and refraining from cleaning it up when leaving sometime later. This distinction results from a split they make in the model of littering behavior between the action of placing litter and the vacating of that location. Other studies have made other classifications. Curnow and Spehr (2001) identified several types of littering behavior, of which they name the following:

- Wedging (pieces of litter are stuffed into gaps between seats and other places),
- Fragrant Flinging (used materials are thrown through the air),
- Inching (material is littered and the person slowly moves away from it),
- Foul Shooting (litter is thrown at a bin, it misses the bin, and the litterer walks away),
- Undertaking (litter is buried, often in the sand at the beach),
- Clean Sweeping (on arriving at a table where others have littered, litter is swept onto the ground),
- 90%ing (most of the rubbish is put into bin, but some is left behind, or smaller items are dropped),
- Herd Behavior (the tendency to follow the lead of other people and behave in an unusual manner, often going past an empty bin to litter next to an overflowing bin).

It seems obvious that not all different types of littering behavior can be influenced by the same intervention equally efficient.

2.3. Theory of planned behavior

Before going into the possibilities of influencing behavior it is useful to address some behavioral theory. Though not undisputed in the field of psychology, in this paper the 'theory of planned behavior' by Ajzen (1988) is used to model behavior and to find ways to influence it (see Figure 2). Ajzen proposes a model which consists of three conceptually independent determinants of an *intention* to perform a certain behavior.

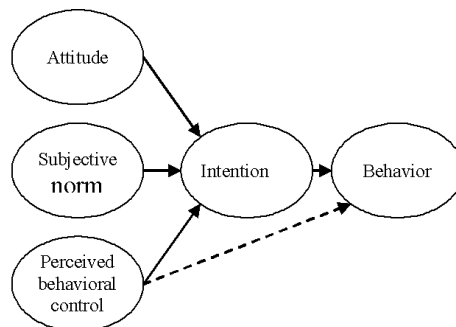


Figure 2 The Theory of Planned Behavior, as developed by Ajzen

These are the subject's 'attitude' towards this specific behavior, the 'subjective norm', i.e. 'the person's perception of social pressure to perform or not perform the behavior under consideration' (p.117), and the 'perceived behavioral control'. This latter factor 'refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles' (p. 132). Whether the intention thus obtained actually leads to the performance of the behavior depends on the *actual* behavioral control, which is dependent on factors as time, knowledge and availability of facilities. When applied to littering attitude describes a person's beliefs about littering, i.e. that fruit remains are biodegradable, and therefore not litter. Attitude also describes a person's character, e.g. their tendency to comply with social norm and their willingness to walk a few meters extra to do that. The subjective norm would be the behavior of other people. The perceived behavioral control is influenced by environmental factors, such as the availability of

trash receptacles. If one wants to influence behavior one cannot limit oneself to changing the environment, and thereby the actual behavioral control people have in a certain situation. One has to look at these three determinants of behavior as well.

2.4. Influencing littering behavior

Several studies have modeled littering behavior in such a way as to provide indications for how to influence littering behavior. These studies were not aimed at packaging design, but their general conclusions can provide clues for guidelines. As said, Sibley and Liu (2003) argue that a conceptual distinction should be made between active and passive littering. They conclude from their research that passive littering is more resistant to change than active littering. As they conclude later from the success in reducing littering through signage and placement of more trash receptacles, which showed that they had succeeded in making subjects switch from passive littering to active nonlittering: '*... This increase in active nonlittering (...) suggests that passive littering may be maximally reduced by targeting the first stage of the littering process and stopping people from placing their litter in the territory they are occupying in the first place.*' Cialdini *et al.* (1990) worked from social norms theory. This theory is strongly debated in the field of psychology as not all scientists believe that social norms determine behavior. Yet as Cialdini *et al.* demonstrate successfully a distinction has to be made between two types of norms; the descriptive norm and the injunctive norm. The descriptive norm is what most people are actually doing, the injunctive norm is what ought to be done. This injunctive norm describes socially acceptable behavior, which of course is cultural dependent. However, in most cultures littering is considered socially unacceptable. In their research on littering, using handbills as a test material, they showed that behavior is influenced by the salient norm, i.e. the norm on which a person's attention is focused. If a person is made to actively focus on the injunctive norm not to litter, for instance through a clean and tidy environment, this person is less likely to litter, even if this focus is achieved by showing this person an example of an act of littering into that environment (descriptive norm). Next to littering behavior studies that might provide clues for packaging design solutions, there are some specific examples of packaging design related to littering worth reviewing. These are either specifically aiming to reduce littering, or have had that reduction effect, without directly aiming for it. For instance,

several patents have been obtained for designs of cigarette packs that included an ashtray. Gum manufacturers have presented several designs that aimed at providing a clean option for pocketing used gum. The chewing gum brand 'Sportlife' introduced the kangaroo-bag in 1997 and gum-wrappers in 1998 (anon., 1997 and anon., 1998). Another clear example is the design change in soft drink cans. In early cans the tabs were torn off completely. These tabs were highly litter sensitive, and also presented health issues, because of the danger of cutting oneself. In the mid-1970s a stay-on tab was developed. Credit for this development is usually given to Cudzik of Reynolds metal company, who obtained a patent in 1976 (Cudzik, 1976). Another product example is the water bottle by Evian, which has both been designed and promoted to be carried along openly by consumer. The same strategy is followed by Font Vella. This Spanish brand introduced a bottle with a campaign that gave the brand a cool image and that explicitly stimulated its consumers to carry the bottle around, and be seen doing so. Especially a lot of young people responded to this campaign. The motivation of the company was obviously marketing, but it has a clear anti-littering effect as well.

3. PURPOSE

The purpose of the project is to translate socio—psychological factors that have been found to be relevant in literature to guidelines for packaging design. As section 2.2 showed, there are several classifications available distinguishing between different types of littering behavior. It seems likely that packaging designs that may help prevent certain types of littering behavior have no effect on other types of littering behavior, or even causes that type of behavior to be stimulated. Hence the guidelines that will be developed have to be connected to specific types of littering behavior to become effective and efficient. A tool will be developed to assist the packaging designer in selecting to most relevant guidelines for his design assignment.

4. GENERATION OF GUIDELINES

Based on the literature and the specific package design examples, guidelines can be formulated for package designers. This synthesis has been done in an iterative process based on scenarios of most likely littering behavior, which in turn were based on the classification presented by Curnow and Spehr (2001), as mentioned in section 2.2. At first a set of 25 guidelines was generated. To evaluate these

guidelines a twofold strategy was applied. Firstly a creativity session with 9 industrial designers was held and secondly an experienced packaging designer was confronted with the improved guidelines. First, the creativity session will be discussed, then the interview.

An assessment was made of the certainty of each of the guidelines. In the creativity session the 9 most uncertain guidelines were presented to the designers without further comments. By letting the designers come up with creative solutions the extent in which the guidelines stimulate creativity was assessed. Furthermore the sensibility and phrasing were evaluated. The interview, on the other hand, was used to evaluate the practical feasibility was evaluated, i.e. to see if and how the guidelines conflict with normal packaging design practice. Again the phrasing was evaluated.

Hence, the *set* of guidelines was tested for completeness and against overlapping guidelines. The individual guidelines were tested for clearness and their ability to stimulate the creativity of designers. This evaluation led to some reformulation of the guidelines, resulting in the following set of 15 guidelines.

- **Provide clear indications for proper use (use cues).** (Supported by the theory of planned behavior (Ajzen, 1988) as in improvement of the perceived behavioral control and the theory of scripting by Jelsma and Knot, 2002).
- **Prevent closures coming loose from the package.** (Supported by the example of the can closures and the conclusion by Williams *et al.* (1997, p. 56) that very small items are more likely to be littered.)
- **Treat each separately packed sub-unit as if it were a single package.** (The smallest packed units have the same, if not higher chance, of being littered as the bag or box containing them).
- **Try to give the package a second function after use.** (Supported by the example of PET bottles that are taken home to be used as water bottles later (Williams *et al.*, 1997, p. 56)).
- **Put a label on the package that states decomposition time.** (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))
- **Give the package an appearance of higher value.** Based on the assumption that people are less inclined to throw away something of value.
- **Make the user more aware of the package.** (Supported by the conclusion of Sibley and Liu (2003) that trash placed in the environment a person is occupying is likely to be forgotten, hence the more aware a person is of a packaging, the smaller the chances that it will be forgotten).
- **Design the package in such a way that it can be re-closed and carried along.** (Supported by the finding that people are more likely to litter trash that is messy, or has a high risk of becoming messy (Williams *et al.* (1997, p. 56)). Also supported by the theory of planned behavior, through positively influencing both attitude and perceived behavioral control. Furthermore as Williams *et al.* (1997, p.50) state, littering is more likely to occur at transition points, '*when people are switching from one type of activity to another*', such as waiting for a bus, and then getting on it).
- **Give the package more volume and stiffness.** (Common sense tells us that such a package will be less easily wedged in cracks and gaps of furniture. Also supported by the conclusion by Williams *et al.* (1997, p. 56) that very small items are more likely to be littered.)
- **Design a package that keeps the user occupied.** (Supported by the conclusion of Sibley and Liu (2003) that the most effective way to prevent passive littering is by stopping people from placing their litter in the territory they are occupying in the first place.)
- **Design a package that contributes positively to the user's image.** (Supported by the Evian and Font Vella examples, where carrying the bottle is presented as a cool thing to do. Also supported by the theory of planned behavior, as influencing the subjective norm).
- **Design the pocketing of the packaging to be a ritual.** (Supported by the concept of scripting (Jelsma and Knot, 2002))
- **Assure free use of hands as much as possible while using the package.** (Supported by the theory of planned behavior, through positively influencing both attitude and perceived behavioral control).
- **Design a package that can be put away compactly and cleanly.** (Supported by Williams *et al.* (1997, p. 56) and Encams)
- **Design the package to function as a trash bin for products remains.** (Supported by the gum-wrappers and kangaroo bag by Sportlife).

5. DEVELOPMENT OF TOOL

Having generated these guidelines two possible paths of action are available. First the guidelines can each be treated as individual hypothesis that could be tested in field experiments. This would be a sensible and relevant addition to the literature on littering behavior, yet it would take a lot of time to produce results that would be useable in practice. Hence, a second option was chosen, namely to integrate these guidelines into a demonstration tool. Even though the guidelines are only based on theory and a few specific design examples this approach is considered best for generating awareness on the influence of packaging design on littering behavior, and thus stimulate more research in this area. Furthermore a tool allows for direct applications.

However, a design tool typically has to be integrated into a more general design methodology. In the field of packaging design there is not one set methodology. Literature and industry present several design methodologies specifically developed for packaging design or methodologies that can be applied to packaging design (for a discussion see Ten Klooster, 2002, p. 24). Therefore it is not useful to make a design tool that is an adaptation of a specific design methodology. This would render it useless to a lot of designers who use a different methodology. Nonetheless, a thing that all design methodologies have in common, is that somewhere during the design project there is a creative phase in which ideas have to be generated that might solve the design problem at hand. Furthermore this is the phase of the design process where litter-prevention considerations may be most effective in influencing the final design of the package. Hence, a tool designed to help the designer in this creative phase would be useable for all packaging designers.

5.1. Behavioral scenarios

As described in section 2.2 there is not one type of littering behavior. Wedging is only similar to foul shooting in its end result; a littered environment. From a packaging design perspective, preventing wedging would require different design solutions than foul shooting. Not all guidelines formulated in chapter 4 will help prevent all of the different types of littering behavior. Hence a set of scenarios are needed that describe different types of littering behavior. Here behavior is taken to differ from other behavior, if the packaging design guidelines that would apply to it differ. The development of these scenarios

was based on the set presented by Curnow and Spehr (2001). In an iterative process these sets were linked to the guidelines. Behavioral scenarios with the same set of guidelines were combined into one scenario. The others were redefined where necessary. This resulted eventually in five scenarios remaining:

- **Leaving behind.** This is behavior where people are unaware of their litter and leave it behind, or where they are aware of it, but leave it nonetheless due to the absence of easy trash disposal and because they are in a hurry. People that are less tidy will be less aware of their litter, and are therefore more likely to leave it behind.
- **10% litterer.** This is littering behavior displayed by people who are tidy and do not want to litter. However, they are unaware of the fact that they objects they are dealing with are litter. They may think that it decomposes quickly or that it is too small to matter. When in groups, and thus under stronger social influence, they will be more aware of their own behavior, even when in a hurry.
- **Decline responsibility.** This is littering behavior justified by the litterer by holding someone else responsible. These people say someone else should have made sure there were (empty) trash receptacles, or should have tidied up the place (like canteens). This category also includes a lot of herd behavior.
- **Wedging.** This is behavior displayed by tough people when alone and bored. They start forcing their litter in cracks and opening in public furniture.
- **Throw away openly.** This behavior is displayed by tough people in groups. They feel that disposing of their trash in the socially acceptable manner is lumpish and pathetic. They want to emphasize their coolness. This behavior is more likely to occur in situations of boredom, as group members are more aware of each others' behavior in such a situation than when hurried.

These scenarios are linked to the set of guidelines as presented in Table 1.

Now all that needs to be done to select the most relevant guidelines for a specific design problem is to identify the most likely type of littering behavior for a certain product. However, simply presenting the packaging designer with the five possible scenarios will not do, as the designer does not know which type of littering behavior is most likely to occur with his or her product. Hence, the five scenarios have been linked to aspects a designer is aware of. To do this

Table 1 The link between littering scenarios and packaging design guidelines

Guidelines:	Leaving Behind	10% Litterer	Decline responsibility	Wedging	Throw away openly
1. Provide clear indications for proper use (use cues)	X	X	X	X	X
2. Prevent closures coming loose from the package.	X	X	X	X	X
3. Treat each separately packed sub-unit as if it were a single package.	X	X	X	X	X
4. Try to give the package a second function after use.	X	X		X	X
5. Put a label on the package that states decomposition time.	-	-	X	X	-
6. Give the package an appearance of higher value.	X	-	-	X	-
7. Make the user more aware of the package.	X	-	-	-	-
8. Design the package in such a way that it can be re-closed and carried along.	X	-	-	-	X
9. Give the package more volume and stiffness.	-	X	-	-	-
10. Design a package that keeps the user occupied.	-	X	-	-	-
11. Design a package that contributes positively to the user's image.	-	X	-	-	X
12. Design the pocketing of the packaging to be a ritual.	X	-	-	-	X
13. Assure free use of hands as much as possible while using the package.	-	-	-	-	X
14. Design a package that can be put away compactly and cleanly.	X	-	-	X	-
15. Design the package to function as a trash bin for products remains.	X	-	X	X	-

the five scenarios have been studied for aspects that would distinguish them from one another. This was done from the perspective of the theory of planned behavior, namely by looking for factors related to attitude, subjective norm and perceived behavioral control. In an iterative process a selection of three dimensions was made. For attitude this is a scale describing the character of the likely user running from neat to tough. For the subjective norm this is the factor whether the likely user is alone or in groups. For Perceived behavioral control this is the likely situation of use, which can be hurry, rest or boredom (see Figure 3). To make a proper distinction between the five scenarios the scale for attitude has to be a four point scale. By this combination of a 2-point, a 3-point, and a 4-point scale it was possible to assign always exactly one behavioral scenario to each combination of the three dimensions, as is displayed in Figure 4. By indicating the most likely situation of use of a product, as described by the three dimensions, a package designer can thus select the most likely littering behavior for his product, and thereby the most relevant guidelines.

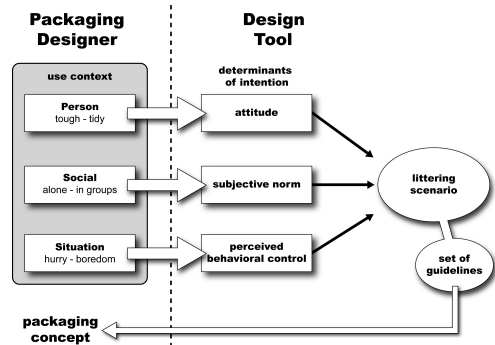


Figure 3 The relationship between littering scenarios and the three dimensions representing the determinants of behavior

6. THE TOOL

Now that the basis for the tool is finished, it is possible to consider the presentation of the tool. The tool typically lends itself to be implemented a software. At this point in the development it is still unclear whether a CD-ROM or an Internet-based tool is more applicable. This depends heavily on the de-

cisions concerning the maintenance of the tool, i.e. whether updates of the tool, such as the adding of good examples, is restricted to the supplier of the tool or can also be done by the users. For now a CD-ROM version was made, for the evaluation of the tool (see chapter 7).

The tool is to be used by package designers in the creative phase of the design process. When started, the tool will present the user with an introduction explaining the use of the tool (see Figure 5). The main screen of the tool (also Figure 5) then presents the user with the three scales for the three determinants of behavior. When a position has been chosen on each of the three scales, an explanatory text of the littering scenario is given. If the designer feel this is appropriate, he can determine the connected guidelines.

The tool doesn't just present the bare guidelines. It was deemed essential to include a description of the goal of the guideline and a limited justification. Furthermore a competitive advantage was indicated where applicable. Such as the Font Vella example, where litter prevention coincides with higher brand exposure.

To demonstrate the practicality of these guidelines examples were sought that show how the guideline could affect the design of a package. Both examples of good and bad designs were selected. These examples were integrated in the tool to stimulate creativity in designers. Also, ideas generated in the creativity session used to evaluate the guidelines (see chapter 4) were integrated. This way, the final presentation of a guideline is as shown in Figure 6.

7. EVALUATION OF TOOL

The tool was evaluated by presenting it to several people active in the field of packaging. This included a package designer from a major candy manufacturer, the senior advisors of a Dutch packaging brand organization, the packaging expert of a major Dutch retailer, and four senior staff members from the anti-littering organization in the Netherlands. Due to the limited number of participants in the evaluation and the variety in their backgrounds the evaluation was conducted in one-on-one interviews. The evaluation showed that tool answers a need in the field to make the complicated matter of litter prevention through packaging design manageable. It was felt to be a useable tool, as it limits itself to informing and inspiring the designer.

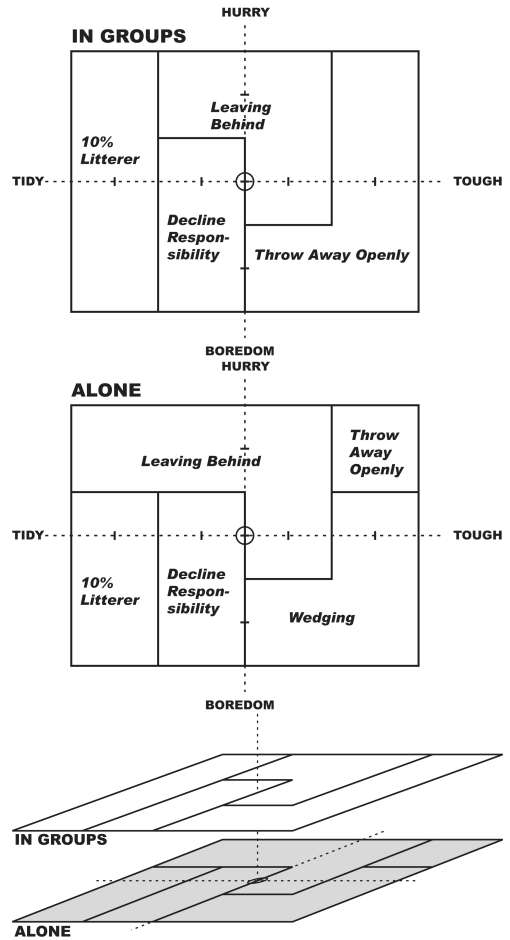


Figure 4 The relationship between littering scenarios and the three dimensions representing the determinants of behavior

8. FUTURE RESEARCH

It seems obvious that a lot of research on the link between packaging design and littering behavior remains to be conducted. Each of the guidelines presented in this tool deserves to be tested in one or more field experiments. Currently preliminary experiments are being conducted to test the guidelines. Furthermore the tool is being used to interest businesses, trade organizations, and anti-littering organizations in starting a more substantial research project to study the influence of packaging design on littering behavior.

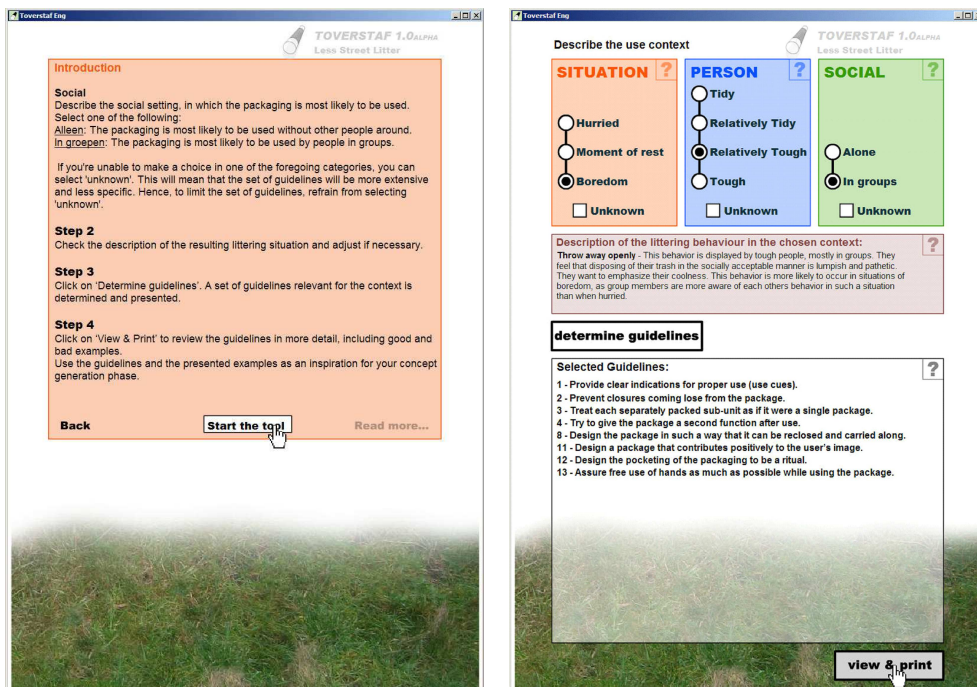


Figure 5 Opening screen and main screen from the tool

9. DISCUSSION

The tool presented in this paper deals with a new approach to litter prevention. It is not claimed that this tool will solve the problem of littering. As with prompts, or the placement of trash receptacles, each anti-littering approach can help reduce littering. No single measure will solve the problem entirely.

Furthermore, a tool like this should not be applied without thought. As anyone working in the field of sustainability will see immediately, several of the guidelines presented in this tool are contradictory to the normal sustainable or eco-efficient approach to packaging design, which aims at resource conservation and waste reduction. Hence this tool is most suitable for those packaging where litter is a major part of the sustainability problems caused by that packaging.

For packaging that has no real chances of being littered, for instance because the product is always used indoors, it is not wise to apply the guidelines from this tool in favor of normal eco-design of packaging.

An important factor that will have to be dealt with

before the tool can be released is the method of use (Internet or CD-ROM) and the method of keeping the tool up to date (centralized or by individual users).

10. CONCLUSIONS

The tool presented in this paper has demonstrated that there is an approach to litter prevention that has so far been ignored. It has also been shown that this approach shows a serious potential for contribution to the existing mixture of measures aimed at reducing litter.

ACKNOWLEDGMENTS

This project was done in connection with the 'Duurzaamheidswinkel' (Sustainability shop) in Amsterdam, who are acknowledged here for their support. Furthermore the authors would like to thank the industrial designers and people from the packaging field, who were willing to provide us with their input at several stages during the project.

REFERENCES

Ajzen, I (1988) Attitudes, Personality, and Behavior. The Dorsey Press, Chicago.

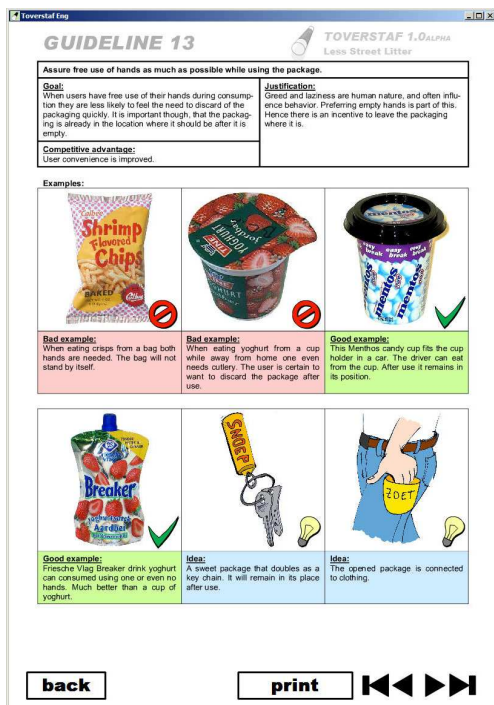


Figure 6 An example of the final presentation of the guidelines as presented by the tool

Anon. (1997) "Kangaroo Bag voor Gebruikte Kauwgom." [Kangaroo Bag for Used Gum]. Voedingsmiddelen technologie Vol. 30 no. 13

Anon. (1998) "Kauwgom-afvalpapiertjes voor Sportlife Doordrukstrip." [Gum Wrappers for Sportlife Gum Packs]. Verpakingsmanagement, Vol. 14 No. 9

Cialdini, R.B.; Reno, R.R.; Kallgren, C.A. (1990) "A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places." Journal of Personality and Social Psychology Vol. 58 No. 6, 1015-1026

Cudzik, D.F. (1976) "Easy-open wall." US patent 3,967,750

Curnow, R.; Streker, P.; Williams, E. (1997) Understanding Littering Behaviour in Australia: A Review of the Literature. Beverage Industry Environment Council, Pyrmont, Australia

Curnow, R.; Spehr, K. (2001) Measuring Environmentally Desirable Change in Australia: Litter-

ing Behaviour Study III – Understanding Littering, Binning and Recycling. Beverage Industry Environment Council, Pyrmont, Australia

De Kort, Y.A.W.; McCalley, L.T.; Midden, C.J.H. (2004) "Effecten van Normactiverende Afvalbakken op Vermindering van Zwerfafval; Literatuurverkenning en Twee Experimenten" [Effects of Norm-activating Trash Receptacles on Reduction of Littering; Literature Review and Two Experiments] (in Dutch). Cited in: Nederland Schoon & CROW (2005) Afvalbakken in de Openbare Ruimte. [Trash Receptacles in Public Spaces] (in Dutch). CROW publication no. 209

European Union (1994) "Directive 94/62/EC on Packaging and Packaging Waste." Official Journal L 365, 31.12.1994, 10

Hansmann, R.; Scholz, R.W. (2003) "A Two-step Informational Strategy for Reducing Littering Behavior in a Cinema." Environment and Behavior, Vol. 35 No. 6, 752-762

Jelsma, J.; Knot, M. (2002) "Designing Environmentally Efficient Services; a 'Script' Approach." Journal of Sustainable Product Design. Vol. 2 pp. 119-130

Krauss, R.M.; Freedman, J.L. Whitcup, M. (1996) "Field and Laboratory Studies of Littering" In: Goldstein, A.P. The Psychology of Vandalism. Plenum Press, New York

Nederland Schoon (2002) Yearly Report (Holland tidy) (in Dutch)

Nelissen, N.J.M.; Kok, G.J. (1991) "Milieusociologie, milieuedrag en gedragsverandering." [Environmental sociology, environmental behavior and behavior changing], IN: Boersema, J.J. *et al.* (Eds.) Basisboek Milieukunde [Basic Environmental science] (in Dutch). Boom, Meppel, the Netherlands.

Sibley, Ch.G.; Liu, J.H. (2003) "Differentiating Active and Passive Littering; A Two-Stage Process Model of Littering Behavior in Public Spaces.", Environment and Behavior, Vol. 35 No. 3, May 2003, pp. 415-433.

Stern, P.C.; Oskamp, S. (1991) "Managing Scarce Environmental Resources", IN: Stokols, D.; Altman, I. Handbook of Environmental Psychology, Vol. 2. Krieger Publishing Company, Malabar, Florida

- Taylor, R.B. (1985) "Environmental Psychology." In: Altmaier, E.M. and Meyer, M.E. Applied Specialties in Psychology. Random House, New York
- Ten Klooster, R (2002) Packaging Design; a Methodological Development and Simulation of the Design Process. Thesis Delft University of Technology
- Terpstra, J.B.; Hotchkis, R.; Scheffer, W.C.M. (1979) "Bestrijding van zwerfvuil; achtergronden en uitgangspunten: verslag van een voorstudie" [Fighting litter: backgrounds and principles: report of a preliminary study] Instituut voor Toegepaste Sociologie, Nijmegen, the Netherlands
- Thijssen, W (2002) "Zwerfvuil kost Nederland handevol geld". [litter is costing the Netherlands vast amounts of money]. De Volkskrant, Juli 19th, pp. 7.
- VRM (Dutch Ministry for Housing, Spatial Planning and the Environment) (2002) Third Packaging Covenant
- Williams, E.; Curnow, R.; Streker, P. (1997) Understanding Littering Behaviour in Australia. Beverage Industry Environmental Council, Pyrmont, Australia

