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Packaging: a box of delights or a can of worms? The contribution of ergonomics to the usability, safety and semantics of packaging.

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ABSTRACT

Background

Product packaging offers manufacturers tremendous opportunities to satisfy the needs of the various stakeholders in the products' lifecycle. It can obviously protect during distribution, advertise the contents of the pack, ensure sterility and prevent tampering and inform the end user how to make use of the contents and dispose of or recycle the packaging itself. Package characteristics can also help shape buyers' impressions at the time of purchase and during use. In recent years buyers have shown a willingness to pay more for improved packaging, but there are limits. (Dibb & Simpkin et al, 1997)

Unfortunately research shows that there is also a darker side to packaging and that there are a large number of injuries either caused by, or directly associated with, packaging. It is a socially unacceptable fact that some 49,000 UK consumers need hospital treatment from injuries through opening grocery packaging each year.

Highlights

This presentation is a review of work carried out by a number of agencies into the safety and usability of packaging and will show, for example that:

- 'Tin' cans send 19,000 people to casualty every year and this is only about a third of those injured as the rest go to their GP or are treated at home. This is an improvement in the situation prior to the DTI campaign on packaging safety. (Hansard, May 2003)
- carbonated bottles, when mishandled during opening, cause serious eye injuries
- hard to open plastic packs force people to desperate opening measures that cause injuries, typically from knives.

We will discuss the various aspects of pack design that research shows can ensure that packaging is easy, or at least easier to open, that instructions and on-pack warnings do their job effectively and that various legal aspects of packaging such as child-resistance are complied with.

Implications for industry

As packaging has to fulfil so many different and often conflicting functions (be secure whilst at the same time being easy to open) its design is normally a compromise.(Stewart, B., 1995). The accidents and problems that we see often arise from design flaws within the packaging, which usually come about through this compromise. Design, in the guise of styling, is an important factor in packaging, as it can be used to draw attention to the product in a competitive consumer market. However, designers must be aware of the importance of ergonomic factors in the functional design of packaging, as inadequate attention to user capabilities can lead to dissatisfaction and accidents (Bloch, 1995). Packaging Design / user mismatches can lead to difficulties in opening packaging, which in turn can also lead to inappropriate tool use so that consumers can feel forced to slash and break their way through packaging, leading almost inevitably to injuries.

Making packs that are easier to open

Research by PIRA has produced some suggestions for improving packaging design (Page, 2000). They suggest that market research be used more exhaustively as a development tool, and that awareness of consumer needs is very important, particularly the needs of minority groups such as left-handers, and disabled and elderly people (Page, 2000). The production of packaging that minority groups can open should be an important feature of packaging. PIRA also suggests that an awareness of effective tools for opening packaging would be an asset to manufacturing companies. These suggestions point the way forward for manufacturing companies. However, there are still other aspects of the consumer – product interaction to take into account when designing packaging. Psychological factors have also been shown to have an impact upon the openability of a package. The point is that openability should not be regarded as an additional issue to add to pack design but as an integral requirement that must be addressed on behalf of the consumer.

In order to design easy-to-open packaging it is necessary to be aware of the abilities of the consumers who will be using the packaging. The packaging should be easily opened, not only by the mythical ‘average’ consumer, but by elderly and disabled consumers as well. This is well illustrated by the Applied Centre for Gerontology maxim "*Design for the young and you exclude the old; Design for the old and you include the young*".

Designing packaging for all

It is well-known and obvious point that the difficulty of carrying out everyday tasks increases with age. The majority of older and disabled people generally find that their needs are not considered by designers and so the fact that we will have reduced abilities to see, grip or reach as we get older needs to be accepted by designers and those who commission design, merely as the normal and predictable part of life that it is.

For many of us food packaging is notoriously difficult to open. For older and disabled users, problems with the packaging are amplified to the point where a significant number of people cannot actually get to the food. It is estimated that nearly 20% of people over 55 have stopped buying certain food products because they have experienced difficulties opening them. This equates to nearly 3 million people in the UK – 3 million. The office of population census and Surveys (OPCS) figures point to an explosion in the number of people aged over 65 years old. A 58% increase will occur from 9.1 million in 1991 to 14.4 million by 2031. (Institute of grocery distribution) It is not only the physical increase in numbers of elderly people that impact the industry but also changes in their expectations; they will no longer simply accept problems and quietly go away..

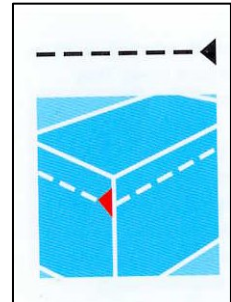
The Packaging Standards Council found that elderly people tend to experience particular problems with screw closures, tin cans and flexible packaging (PSC, 1996). A DTI study found that the specific packaging types that were found to be especially difficult for older users to open were shoe polish tins, jam jars and cheese packaging (DTI, 2000). The Helen Hamlyn Research Institute found that five of most problematic type packs are: Bacon packs, fresh soup pots, ring pull tins, jam jars and sardine tins. The Institute of grocery distribution identified the most difficult to open packages were:

- Liquid packaging
- Metal closures
- Cans
- Flexible Packaging
- Tamper evident
- Child resistant closures

Packaging which requires fine manipulation and high levels of grip force cause the most difficulty to disabled consumers. The bulk of these problems appear to be centred on hand strength, dexterity, and the understanding of how packaging should be opened (PSC, 1996).

It is therefore fair to say that packaging openability is a common consumer concern in the grocery industry and those who carry out research in the area. Various recommendations have been made to help.

For example, the Packaging Standards Council found that tear tapes were appreciated by elderly consumers. The recommendations are that the length of the tab be identified on the pack in a contrasting colour and the start tab be clearly marked in a primary contrasting colour.



Clear instructions on how to open the packaging are also very important. An example is shown on the left where two, clearly presented instructional diagrams fully use the space available which will assist consumer understanding. However, always ensure that the instructions are actually workable.

The Helen Hamlyn Research Institute considers that there are a number of different ways packaging can be made easier to open:

- Standardising packaging types.
- Using best existing packaging.
- Selling the best possible opening aids/tools - A number of assistive devices have been developed by OXO good grips, as well as others.
- Make minor changes to existing packaging.
- Developing wholly new packaging types.



Further research into the interaction between elderly consumers and packaging may produce more guidelines on making the opening and using of packages easier for the elderly consumer..

Designing for safe(r) opening

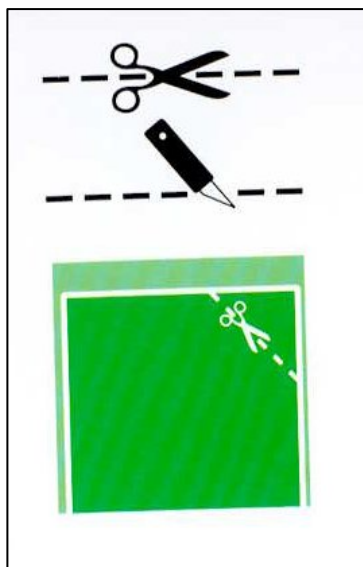
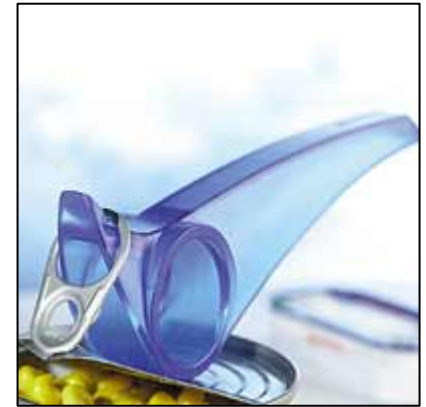
In 1997 packaging related accidents involving knives account for 6% of all the reported accidents. This percentage relates to consumers cutting into packs, and cutting themselves in the process. This inappropriate use of a tool often comes about through frustration.

Consumers reported that when they are unable to open packs such as those containing cooked meat, cheese, packs of frozen foods, and tamper evident closure bottles easily and quickly,



they would resort to using a tool (DTI, 1997). Consumers admit to using a wide variety of inappropriate tools, including pliers, screwdrivers and doorjambes. Consumers tended to use knives rather than scissors, despite

packs recommended using scissors, because knives were more readily available and speed was a major requirement. Sharp knives are selected as consumers know they will open the pack. The potential for accidents through such tool use is obvious. The only solution is for manufacturing companies to produce appropriate tools to open specific packs, or to produce packaging that does not require a tool to open. Consumers tend to view appropriate tools as useful but expensive (DTI, 1997). However, some tools are quite complex and if consumers have difficulty using the tool they are likely to discard it and use an inappropriate implement. The ideal solution is therefore for the companies to produce packaging which does not require a tool to open. Easy open tear tabs and peelable seals are possible solutions.



Ideally knives should not be used to open grocery packaging but unfortunately (63%) do use them. Therefore instructions should be clear to prevent misuse and although it is no substitute for a pack that is easy to open, giving proper advice on how to safely open a pack that does need to be cut open can help. For example show the correct cutting action.

The scissors/knife illustrate the tool to be used, the motion and the direction. It must be bold and clearly contrast and the direction of the scissors should be shown correctly.

Designs of Child Resistant Closures (CRCs)

The regulations in the UK controlling the use of CRCs are the medicines (Child Safety) Regulations which require the sale of aspirin and paracetamol in recloseable packs to be sold in a pack with a CRC, and the chemicals (Hazard information and Packaging for supply) Regulations 1994 (CHIP2). In practice the number of products that have to be packed in reclosable or non-reclosable containers is quite limited but in practice CRPs are used in other situations such as when requested by the super market or to conform with a perceived customer expectations that a CRC should be fitted. The words of the draft standard on non-reclosable packaging for non-pharmaceutical products warns

The use of child-resistant packaging needs to be confined to those products that are potentially hazardous, or for which any legislation makes its use mandatory, since, if used in other circumstances, there could be confusion over the degree of hazard posed by the product.

The three most common types of CRC are based on the following principle:

- Push down and unscrew;
- Squeeze and turn;
- Line up arrows and push off

The principle is that toddlers cannot perform two dissimilar functions at the same time. Unfortunately neither can many older or disabled people which leads to real difficulties for



those who must use the containers. However, this is not inevitable and a few years ago a company received the first “Owl Mark” from the Centre for Applied Gerontology at the University of Birmingham, for its tamper evident child-resistant closure. The endorsement was because the closure is easier to use by older people. It is 45% deeper to give a better grip, has double the number of interlocking points for faster engagement, does not have to be done up so tightly and can be opened by turning through 90 degrees rather than 180.

The main decision points for industry to voluntarily use CRCs would therefore appear to be:

- Cost
- A desire to be reasonable in terms of consumer safety
- A requirement by a third party in the supply chain (e.g. supermarket)

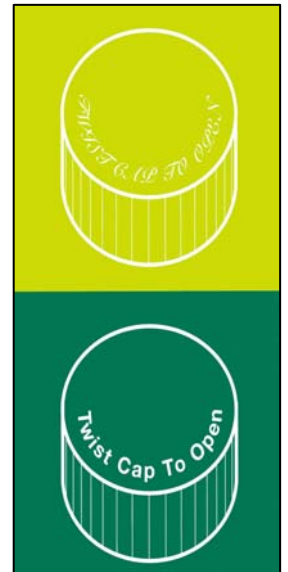
- The level of safety consumers might reasonably expect is to have a CRC fitted.

Designing on-pack information

As far as consumer expectations are concerned, in ergonomic tests, it was evident that as consumers handled and used packs containing products that they thought were potentially harmful to children, they felt some kind of warning was required. They felt that the warning must be instantly recognisable to children and deter them from opening the pack. Consumers thought that some parents are unaware of the danger of certain household products to children and needed reminding and therefore a symbol would be a good idea. However, this is easier said than done and there are also requirements for a wide range of information to be included on packaging, both legal and voluntarily provided customer information. Opening instructions are therefore a small, albeit important, part of what space is used for.

There are some simple principles which enhance presentation when laying out opening instructions.

- Locate the instructions close to the point of opening
- Present the instructions clearly and where possible diagrammatically.
- Educate the consumer through the use of industry standard diagrams.



For on-product information

- **Do not use text consisting entirely of capitals** – in continuous text lower case letters are preferable to upper case letters. Letters with ascenders and descenders stand out and contribute to the image of a word. The reader can see at a glance what is written and need not read letter by letter
- **Do not justify text by inserting blank spaces**
- **Use a familiar typeface** – plain characters without much ornamentation are the most legible
- **Avoid confusion between characters** – some characters are difficult to distinguish from each other, which can lead to confusion. The smaller the number of points forming the character the greater the risk of confusion.
- **Make sure that the characters are properly sized.** Legibility is not solely dependent on type size. Type size is however recognised as the largest contributor of legibility. The ideal print size is 16 – 18 point. A minimum of point 6 is recommended.
- **The longer the line, the greater the required line spacing.** In a text, the required distance between the lines, that is the distance between the imaginary lines on which the letters are placed, depends on the length of the line.
- **Good contrast contributes to legibility.**
- **Produce diagrams that are easy to understand.** Diagrams should be such that they can be understood by everyone and the caption should be legible. The correct letter size will enhance legibility

- **Use pictograms with care.** In principle, symbols are not bound to a principle language. Pictograms are very often poorly understood.
- **Select the appropriate method for displaying information.**
- **Think carefully before using labels and symbols** – sufficient space.
- **Avoid long lines of small text, Hyphens, lines too close together, shadowing of text.**

Symbols are also not always the answer as some warning symbols currently in use can lead to potentially dangerous confusion. Sometimes those helpful symbols don't really help much at all, as they don't convey their intended message. In an increasingly diverse and global society, communication ergonomics (the study of human centred design of communications) is desperately needed to reduced the hazards associated with the products and systems and the additional problems introduced by poor information design

Conclusions

Well designed packs make for attractive, eye-catching products that consumers will want to buy again. Such packs enhance and add value to the contents. Conversely, poor packaging can instil feelings of anger and frustration that will far outweigh any virtues that the contents may have.

Innovation in packaging is important but so is ensuring that the basics of good ergonomics design have been included. As the DT have said

“Businesses are uniquely placed to help respond to the challenge, those who do not will have their market share eroded by companies who do. What's more, responding can be so easy, cheap and above all popular with the consumer. It is imperative that companies are more active in their use of ergonomic testing of new packs and that they seek out solutions to the issues. There are a number of actions which can be taken easily, there are also a number that may require innovative thinking and additional research to solve, for example:

- identify which of your own products are likely to be causing the most problems;
- look to make fundamental changes in packaging in problem areas where this better serves consumers concerns;
- examine all the latest options when producing and marketing new products;
- producers - ask your packaging supplier whether they consumer test packaging for accident hazards and reliability;
- ensure that there is a proper quality control system in place for all packaging;
- remember there is always a balance to be struck between product protection against contamination and tampering and openness;
- look at policy on opening tools for key sectors of the population, particularly the elderly;
- promote safe packaging as a key part of customer care.

DTI will continue to work with businesses to develop practical solutions and to help reduce the number of accidents in the future.

Recommendations

This section summarises key recommendations from the DTI. It is apparent that before companies select a new pack to be launched on the market that they should complete ergonomic tests to assess that packs suitability with consumers.

Tins

Figures have dropped from 26,000 to 19,000 since 1997 but this is still a high number Tins are involved in 42% of all cases. Consumers felt tins are potentially dangerous.

Traditional tin: These require a tin opener to open them.

1. *Manufacturers can help by giving clear instructions for opening the tin and advice on the type of opener required.*
2. *Retailers can assist by merchandising tin openers next to tinned products.*

Ring pull tins: Consumers had extremely varied attitudes about ring pull tins. Consumers liked the packs with diagrams showing how they should be opened and generally found these were clear and easy to understand.

3. *Businesses can help by making ring pulls the appropriate shape and size.*
4. *Retailers can help by providing appropriate tools next to the packs in stores.*

Corned beef tins and other tins with a key: These were disliked by consumers. Consumers felt that a complete redesign was appropriate. Again numbers of accidents have fallen and at a steeper rate than for all tins.

5. *Packaging Companies could lacquer the inside of corned beef cans to help the product slip out more easily.*
6. *Avoid using tins with key altogether.*

Glass packaging: Glass packaging is involved in 30% of all cases. The majority of accidents are caused by people clearing up glass once it has broken. It was very clear that people drop glass packaging because it is often heavy and it is also very smooth and slippery, made worse when packs are taken from the fridge with condensation.

7. *Design packs to include texture or ridges to stop the pack slipping from the hand.*
8. *Lids on glass jars, especially larger diameter lids, should be fluted to improve grip.*
9. *Retailers should ensure that appropriate opening tools are available for consumers who require them*
10. *Manufacturers should review their quality control checks to ensure opening torque's do not get unnecessarily high.*

Plastic packaging: Plastic packaging is involved in 14% of all accidents. Injuries reported were mainly poisonings of young children i.e. it is not the pack itself causing the injury.

11. *Manufacturers should consider whether there is value in wider use of child resistant closures, to help reduce the problem of small children gaining access to hazardous chemicals.*
12. *Ideally turpentine and white spirit should not be packaged in clear plastic bottles.*
13. *Producers should consider what additional warnings they might add to packages containing hazardous chemicals, to warn adults and children of the potential danger of young children gaining access to them.*

Knives: These accidents happen during initial opening of packs and occur across all ages. Packs that are commonly opened using a knife are biscuits, bacon, sausages, ham, cheese, vacuum packs, cellophane overwraps, cooked meats, frozen foods and plastic tamper evident features. Including a tear tab is a very popular option but only if it is clearly marked and immediately noticeable and works.

14. *Industry to continue to put tear tabs on flexible plastics. These should be clearly marked and easy to remove by hand.*
15. *Companies should assess the wide variety of designs and suppliers of tamper evident closures for bottles with a fall away band to ensure they are effective closures that work as intended.*

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