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Opportunities for Sustainable Packaging Design: Learning from Pregnancy as a Metaphor

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Introduction

Current packaging use within fast-moving consumer goods (FMCG) produces a lot of unwanted waste that must be dealt with at significant cost, with negative environmental impacts. In the UK, annually, 10.8 million tonnes of packaging wastes are created; only 24% of plastic packaging is currently recycled (defra, 2011). Many packaging designers approach sustainable issues by various methods, however, this effort only reduces damage to the environment because the packaging still produces a lot of waste in a short period with less valued object, which has a negative impact on the environment.

Some FMCG packaging, e.g. Method's refillable bottles or Unilever's detergent tablets (Unilever, 2000), is designed to promote more sustainable behaviour. However, consumers' perceptions, behaviour and habits have been attributed (Porter, 1999) to decreases in packaging value, driving less careful behaviour.

The emerging field of design for sustainable behaviour (Lockton et al 2008; Wever et al 2008) can be applied to packaging (Wever et al, 2009). However, further knowledge is needed, as designers' intended functions may not match consumers' perceptions and behaviour. Fundamental interconnections need to be articulated, taking a whole system view (Wright and Meadows, 2009). One innovation approach in packaging design involves learning from other disciplines. This paper suggests translating ideas from human biology –pregnancy practice- through metaphor to take a holistic view of the packaging life cycle.

What is Sustainable Behaviour?

The term sustainability has been used as part of the concept of sustainable development. It is defined as a process of improving the quality of humanity while living within the carrying capacity of supporting eco-systems. (SPC, 2011). Following this, the concepts such as eco-design, sustainable design or design for sustainability have been created, and many design communities respond to these emergent environmental and social pressures and broader sustainability trends (Sherwin, 2004). The triple bottom line expands the traditional reporting framework (Elkington, 2012) to take into account environment and social performance.

In particular, the environmentally significant behaviour based on its impact and the behaviour of user interacting with products (Stern, 1992) may be viewed from sustainable development perspective (Daae, 2014). This approach has recently received increasing acknowledgement and attention (Daae, 2014), in particular in work on HCI and energy consumption.

Opportunities in packaging design

Packaging largely serves two functions: to protect or prolong the life of products contained within (including making transportation and storage easier), and to support the marketing of the products. However, the packaging industry also has opportunities to explore other functions around sustainability. In packaging, consumers' attitudes and their use and disposal behaviour are a significant factor that needs to be considered during the design processes, because the use phase (Brezet & vanHemel, 1997) and disposal phase can make a significant contribution to the overall environmental impact for determining the life cycle of packaging and its contained products. Many of the current designed packages are for single-use, to throw away after, which means consumers have a big responsibility to control the package's end of life, whether it ends up in the right bin or is reused. Some of the packaging designs encourage consumers to reuse for other purposes, or suggest how to recycle the package by providing information on the pack. However, its value rapidly decreases during the use phase compared to when it is on the shelf, such that it can easily treated as waste rather than resources in a short period of time, which drives less careful behaviour. It suggests that individual behavioural decisions have a big role in responsibility for use and disposal of packaging. Refill packs can provide up to 67% saving for the consumers (WRAP, 2008) and 1 recycled plastic bottle would save enough energy to power a 60-watt light bulb for 3 hours (Nuwer and Kho, 2014). Storing food, as is the designer's intended function, will increase the longevity of food life. However, habitual, individual and social norms, beliefs and many of other behavioural factors influence people: they do not use, act and dispose in the same way. This suggests that interrelationships between the designed packaging and consumer behaviour are weak, but that there is an opportunity for a stronger link to be created.

Design for Sustainable Behaviour

In many ways influencing behaviour can be seen as a design problem, concerned with how and why people use, interact with and dispose of products they use, and how design interventions might change this. In this respect, packaging design for sustainable behaviour could act as an intervention to shift consumers' behaviour in an environmentally and socially beneficial way. Design for sustainable behaviour is a research area at the intersection of sustainable design and interaction design, applying insights from multiple disciplines to the problems of influencing more environmentally friendly and socially beneficial use of products and services. (Lockton et al 2008; Liley et al 2005,2007; Rodriguez and Boks, 2005; Elias et al., 2007; Bhamra, 2008; Wever et al, 2008; Pettersen and Boks, 2008; Froehlich et al, 2010). This emerging field has been applied to packaging (Wever, 2009). Wever et al. researched on how to influencing littering behaviour through packaging design (Wever et al, 2006) and Lofthouse et al. developed refilliable package system by investigating its feasibility with respect to consumer acceptance and sustainability improvement (Lofthouse, 2009). There are commercial examples: for example, in Japan, self-expiry date stickers are displayed on meat products to signal the longevity of the products, while elsewhere Method, Ecover and other companies offer detergent packaging designed to be to reused and refilled. Unilever's dish wash tablet is also a good example to encourage sustainable behaviour change as it controls user dosage with right portion to use. However, most of these packages are also going to require secondary packaging. Above all, it may not necessarily lead to more sustainable behaviour overall, because the context in use of packaging and products also need to be considered to justify sustainable behaviour. The behaviour change also has to take account of other subsidiary behaviour such as water and energy consumption.

Transforming consumers' behaviour in the context of their impact on the environment through design is challenging. However, packaging design should not just be used as a tool for marketing, but also contribute to changing consumers' behaviour in a more sustainable way, by focusing on use or convenience as well as aesthetic. Human behaviour is a complex domain (Daae and Boks, 2014), therefore possibly requires innovative perspectives or approaches.

Learning from pregnancy as a metaphor

One of the best ways to inspire new ideas is to look at similar experiences in other contexts, instead of focusing too narrowly on the research topic (IDEO ToolKit). For example, Volstad & Boks' biomimicry-inspired decks of cards are available to inspire how nature has solved the challenge of packaging and other domains (Volstad & Boks, 2008). The most recent attempts were learning from nature by experimenting with material such as mycelium, or edible packaging like WikiCell (Tittell & Gunth, 2013). This approach of learning from other contexts can be done directly, or through the use of metaphor, which has a strong history in design practice (Saffer, 2005).

In my current research, I suggest translating ideas from *human* biology—*pregnancy practice*—through metaphor. How could humans' psychological condition during and after pregnancy, the birth cycle, and caring behaviour be translated into sustainable packaging design? By introducing the pregnancy metaphor, it presents new ways of considering relationships between consumers, product, and packaging. Packaging and pregnant woman can be considered to have similar, if not quite shared, experience in terms of physical and physiological phases. For example, the following sentences could be interpreted from two different viewpoints. One is from the mother's perspective and the other is from the packaging's perspective.

- I protect my product. (Protection)
- I transport my product safely. (Transportation)
- I give the nutrition for my product. (Preservation)
- I provide perfect environment for my product. (Material)
- I let other people know what my product is doing. (Expiry date)
- I know everything about my product. (Information on the package)
- I sometimes dress up nicely to show off my bump. (Aesthetics of design)

This suggests that it would be interesting to define metaphorical terms based around the idea that: *Pregnant woman* = packaging, *a baby* = the product in packaging. The idea can be applied into a diagram of a 'birth and life cycle comparison' in figure 1. It represents that pregnant woman is a potential package that may be reusable, and is required for care.
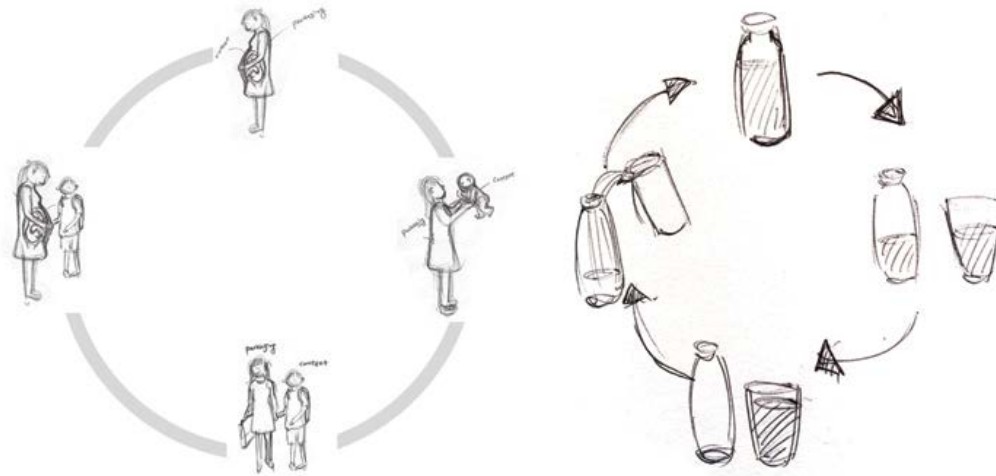
Figure 1) Birth and life cycle comparison of packaging and pregnancy.

Many different functions of packages reflect the pregnancy experience, and its particular language too. In Table 1, some examples are presented.

Packaging function	Pregnancy experience
The food is delivered to table	The baby has been delivered to table
Expire date	Due date
Faulty in system	Miscarriage
Reuse, refill packaging	Being pregnant again
'Handle with care' label	'Baby on board' badge
Extra protection	Amniotic fluid
Gluing on the packaging	Applying chemical on mother's body
Temper proof	Cord
Packaging that self-operate (self- expire)	Linea nigra (Dark line)
Recovery	Mother recover after giving birth
Barcode scan	Scanning
Overdue	Expired
Produce, reproduce	Produce a baby, reproduce a baby

Table 1) Experimenting with language metaphor

After giving birth, pregnant woman = used packaging, a baby = a product to be used or being used. This metaphorical reflection of the end of life cycle of packaging will help to arrive at the answer of how used packaging and the content should be treated (see figure 2). The main question occurring in this context is how a pregnant woman wanted to be treated after giving birth.
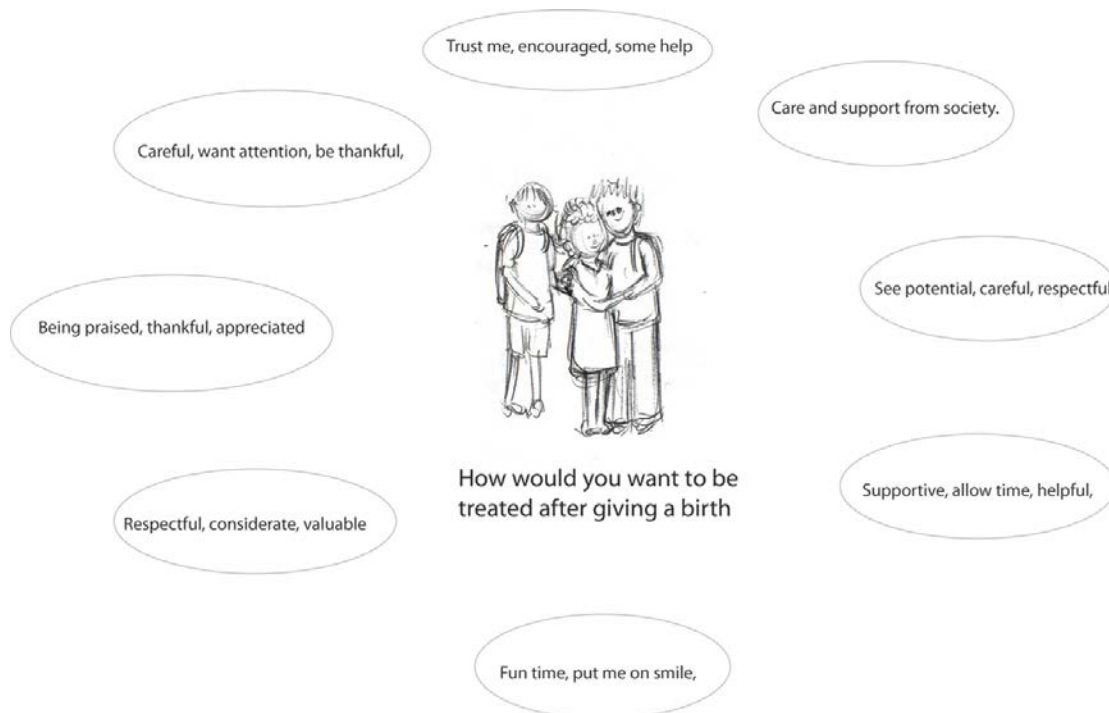
Figure 2) Psychological analysis of after a pregnancy as a metaphorical application for packaging

Interviews with mothers

In order to reach the answer, interviews were conducted with 7 mothers who had gone through pregnancy and were raising children at present. This process aimed to help find triggers for the packaging designer to explore ideas that, ultimately, result in more sustainable and responsible behaviour and to think about the relationships between consumers (=society), product (=a baby), and packaging (=a mother).

Throughout the interviews, the term' Care' and 'Caring' became salient in order to maintain the relationship. Integrating care and caring behaviour and empathic and emotional design approaches could offer designers triggers for stimulating behaviour change in a more sustainable and responsible way. In terms of physical caring, it can be seen through daily activities such as feeding, taking baths, and stroking baby's downy head: these are behaviours which promote healthy growth and development (Waterston, 2009). Intentionally touching a baby is beneficial for the mother too as many of the interviewees stated that they get energy from, and are encouraged by, their children, even with a baby's little responses. The majority of participants stated that caring for a child is not only about the physical relationship but the psychological relationship, and their objectives are more important. Conversation, dialogues and talking are the most common techniques of caring behaviour to build the relationship with babies through psychological interactions. Prioritising their baby's condition and letting them know the results of their behaviour are other powerful techniques to deliver caring behaviours. Although cultural differences and individual experience contributed to identifying the notion of care, this does not have much influence on the fundamental value of care, but the different degrees of care. The participants had the tendency to go through a decision-making process to find the balance of which level of behaviours they needed to prioritise within caring behaviours. All of the mothers who participated in this interview stated that raising their children to be independent is the main goal to achieve; at the same time mothers expected the children to be able to return home when they have problems.

The participants were asked to bring one object which represented care and caring behaviour (see figure 3). Two participants brought their children's comforter, such as blankets and the soft toy. The reason was that the comforter reminded them of motherly care. One mother brought a bottle of Aveeno cream, which is a daily skin treatment for eczema because she prioritises her daughter's health of all.

Figure 3) The objects representing 'care'

Analysis: extracting design principles

The next stage was to bring these ideas together in the form of a design process, with the aim ultimately of influencing more environmentally and socially beneficial behaviour. Possible design principles could be extracted through analysis of the interviews. For example, one mother stated that she makes sure her children know that they have a home to return to, and that is 'care' for her. This can be translated to 'packaging designed that is to have home'. Further design principles, derived along these lines, are the following;

What if the package is designed to...

1. Designed to make the consumer aware of reality
2. Designed to act out certain behaviour, to make a consumer aware of its benefits
3. Designed to have a home
4. Designed to communicate with the user/consumer
5. Designed to communicate between designer, manufacture and consumer
6. Designed to be responsive
7. Designed to give user benefit
8. Designed to remind
9. Designed to help and guide what will happen and what to expect
10. Designed to be taken back
11. Designed to be separable
12. Designed to keep and grow
13. Designed to be trusted and know where it is going/ show path
14. Designed to provide alternative option/ adjustable
15. Designed to be prioritised
16. Designed to reveal that you don't see at the first glance
17. Designed to offer reward, return joy and energy
18. Designed to share good things with you and others
19. Designed to show what is good and bad
20. Designed to give less pressure to consumer
21. Designed to use until certain time/ planned
22. Designed to hug or kiss
23. Designed to resemble carer
24. Designed to have personal meaning
25. Designed through accessible system, so consumers can update or change faulty things
26. Designed to apply strict rules
27. Designed to use or be supported by local community
28. Designed to be interactive with package and the products inside
29. Designed to share the moment
30. Designed to build trust and agreement
31. Designed to keep a promise
32. Designed of natural things
33. Designed to appreciate through experiencing faulty packaging
34. Designed to have less support, to make an independent consumer
35. Designed to have a place to recover
36. Designed to survive
37. Designed to provide a better life
38. Designed to show people that this package will returned

39. Designed to have less burden on a certain domain
40. Designed to let people realise guilt
41. Designed to be part of routines
42. Designed for commitment

Some of design developments

To illustrate the potential use of the design principles, three were selected to develop into design ideas.

Figure 4 is a design concept developed upon the design principles 42: could packaging be made out of fragile material (e.g. glass) that requires careful behaviour by the user, or could it be made out of an absorbable material (e.g. cotton wool or rich fabrics) so it needs to be taken care of by the user consistently to maintain its condition? The concepts illustrated show yoghurt packaged in a glass tube, and a drinking cup covered with fluffy cotton wool.
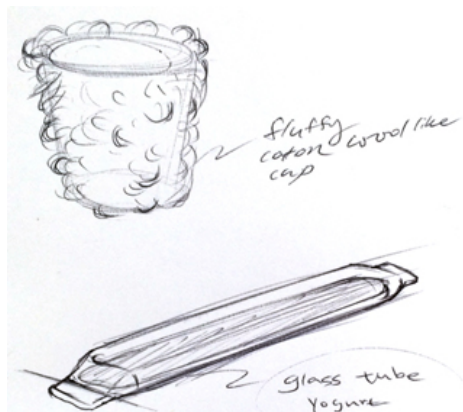

Figure 4) Design idea 1: yoghurt packaged in a glass tube, and a drinking cup covered with fluffy cotton wool.
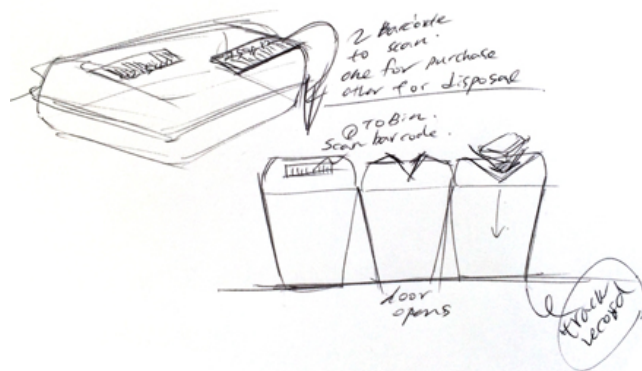

Figure 5) Design idea 2: packaging with two barcodes, one to scan when purchasing and the other to scan when disposing of the package, via a special bin system.
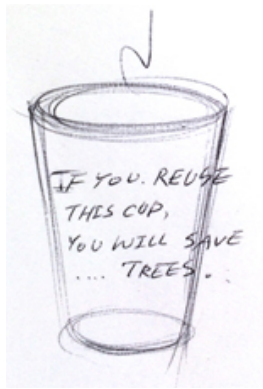
Figure 6) Design idea 3: Graphics on packaging used to show consequences of actions.

An idea applying the design principle 13, 'Designed to know where it is going/ and showing the path' is presented in figure 5. The idea was to have 2 barcodes on the package, one to scan when the item is purchased and the other to scan when disposing of the package. A new bin system could be introduced, which requires a barcode scan in order to discard the waste—also making it possible to trace their path of the package from manufacture to disposal. The Idea behind this is that consumers are, probably, more thoughtful when they choose and purchase the products, as compared with the disposal phase of products. It is to control the consumer behaviour to make aware of their littering attitude toward recycling behaviour.

The final idea is shown in figure 6, adopting the design principle 9 'Designed to help and guide what will happen and what to expect'. Young et al. (2010) observe that an estimated 30% of consumers indicate concern about environment issues, yet only 5% translate this concern into action. The barrier to enacting intention can be lack of knowledge, and information about expected results. In this concept, graphics are used to display, in an informative way, the consequences of users' actions, with the aim of encouraging the user to care for packaging, but also care about the environment.

In this paper, as the research is at an early stage of developing design principles, only one design idea was developed per principle. However, two or more of the design principles can be combined and applied onto one idea. Developing design principles and concepts through considering care and caring aims to provide a relevant insight of possible implications for designers to generate more sustainable behaviour.

Conclusion

This paper has proposed the development of design principles, by taking a holistic view of packaging life cycles and learning from other domains. Future research will involve the investigation of different level of care (e.g. care *of*, care *for*, care *about*, care *that*) (Shaw et al, 2015; Rossi, 2001) in relation to sustainable behaviour and how design can intervene. It will contribute to the growing field of behaviour change, and provide resilient design approaches for new sustainable packaging paradigms.

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