Reinventing refills: guidelines for design

REINVENTING REFILLS: GUIDELINES FOR DESIGN

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ABSTRACT

This paper presents findings from a DEFRA funded collaborative research project run by Loughborough Design School in collaboration with Boots Alliance GmbH, and presents guidelines for design teams regarding the design of successful, sustainable, refillable packaging. The study focused on 'body wash' products in the area of personal care.

A broad range of qualitative methods were used to create a background framework, develop design concepts and test the viability of the design solutions. Two concepts were turned into high fidelity prototypes and tested in multi-activity user focus groups. The prototypes were evaluated from an environmental perspective using the Eco Indicator 99.

Discussion is focused around general findings regarding refillable packing and also on specific findings related to 'concentrates mixed in the parent pack'. The findings from this study have increased understanding about the potential implications of refillable packaging and how it might be successfully utilised by business. A range of guidelines for the design of refills have been identified. Further a more detailed understanding of consumer perceptions, business challenges/opportunities and environmental savings associated with 'concentrated refills that are mixed in the parent pack', has been identified.

It has been seen that to be successful refills must offer good quality; be very easy to use and appropriately delivered; be clearly communicated; be offered through a brand consumers like; and represent good value, whilst radically reducing the amount of packaging manufactured and distributed. Incorporating carefully considered consumer and environmental needs into the brief is critical to the successful development of refillable packaging.

Keywords: eco design, user centered, guidelines, refillable packaging, product development, personal care, circular economy

1 INTRODUCTION

'No one buys packaging for its own sake – people buy food, drink and a host of other products to satisfy their needs and desires'[1] and packaging is the by-product. Although it is widely recognised by industry that packaging provides a number of critical functions such as protection, preservation and communication, consumers often report seeing it as wasteful and unnecessary[2], which can lead to a negative brand image. Moving from single use packs to refillable packaging systems can reduce overall packaging waste and has the potential to improve customer perceptions of brands through the use of an overtly responsible approach to packaging. If designed and used as expected, multiple use refillable packaging systems, can provide greater environmental savings than traditional 'product redesign' approaches typically associated with packaging (e.g. light weighting and selecting recyclable or compostable materials). They also support a move to a more circular economy which advocates amongst other things increased resource intensity and the development of circular flows of materials.

This paper draws on the findings of a three year UK Department for Environment and Rural affairs (DEFRA) funded project, run by the Loughborough Design School in collaboration with Boots Alliance GmbH, a multinational pharmacy-led health and beauty group. The overall aim of this applied research project was to develop a refillable packaging system for 'body wash' and investigate its feasibility within the personal care market with respect to consumer acceptance and sustainability performance. Boots identified their Botanics range as being a good fit with the aim of the project and as such development work was oriented towards this brand. Botanics is a product range exclusive to Boots, which is developed in collaboration with Royal Botanical Gardens, Kew. It uses natural plant extracts to create organic personal care products[3].

The study reported upon in this paper aimed amongst other things to provide guidance for the development of successful sustainable refillable packaging, by better understanding consumer experiences and associated functional requirements. Discussion is focused around general findings which emerged from the background research and the focus groups, and also on specific findings related to the approach of using concentrates mixed in the parent pack (CMPP), which emerged through the testing of two packaging design concepts developed during the study.

2 LITERATURE REVIEW

Refillable packaging has long been recognised by bodies such as WRAP (Waste and Resources Action Programme) and DEFRA (Department of Environment, Food and Rural Affairs) in the UK as having great potential to radically reduce the environmental impact of the packaging industry, where traditional redesign activities have not. This recognition is demonstrated by DEFRA's funding of the 'Refillable packaging systems project' (WRT151/WR0113) on which this paper reports. Demographic and lifestyle changes, such as smaller family sizes and a demand for greater convenience, seen in the UK[4], mean there is an increase in the overall volume of groceries produced and sold[5], and as such despite concerted attempts by signatories of the Courtauld Commitment to reduce the weight of packaging[6], there continues to be an increase in the total amount of packaging being used

(and disposed of) [4,7] .

In the UK, refillable packaging has been utilised in certain sectors for many years, as illustrated by the door step delivery of milk which has been on-going since the 1880s[8]. However refills have been blighted by a number of negative associations such as poor quality and inconvenience [9]. One participant from a consumer questionnaire reminisced about refillable hairspray packaging which used to split on the way home, others associated it with thrift stores where you can buy washing powder or dried fruit in bulk[9]. However markets and attitudes are rapidly changing. Customers are getting used to operating within a service economy and are widely accepting of goods delivered in formats different to their traditional delivery mechanisms [10]. This change in mind-set along with technical advances in materials, means there are growing opportunities for businesses regarding the use of refillable packaging. Despite evidence of growing consideration of refills by the design community [11] there is still a knowledge gap regarding consumer acceptance, functional requirements and appropriate business models amongst other things.

The use of refillable packaging has long been cited as a possible solution to this problem, however in the past attempts to extend the use of refillables beyond a few traditional areas have met with little success. Darlow reported that in 2003 no major retailers in the UK operated any schemes in the reuse of primary packaging[12]. In response to the recognised potential but apparent lack of success, the research project reported on in this paper was set up to better understand refillable packaging systems and the possibilities they offer to the consumer and the environment.

3 METHODOLOGY

A broad range of qualitative methods were used to create a background framework, develop design concepts, test the viability of the design solutions and outline guidelines for designers (see Figure 1).

[Figure 1]

The background research combined a literature review, consumer questionnaire and industry based workshop. This work highlighted people's experiences with refills and led to the identification of many different types of refills, which were categorised with respect to their delivery mechanism and the level and nature of the consumer/ business interaction [13, 14]. Each 'type' combined a unique set of features which makes them more or less suited to different market sectors, which helped guide the selection process later on in the project. The consumer questionnaire made use of this classification to help organise the participant questions.

A questionnaire methodology was selected for the early stages of the project, as it was felt to be the best mechanism for investigating the perceptions of a broad range of consumers from a cross section of society. Support from the Boots consumer 'Evaluation Suite' meant that it could be distributed as an 'over the counter' survey to 200 volunteers from the community, who are selected as being representative of a cross section of society. Of the

120 questionnaires picked up, 36 were returned, equating to a 30% response rate which is significantly higher than the average survey response rate of 8% [15], demonstrating the success of this approach. 89% of the respondents were female and the participants ranged in age from 21 to 60. (Comprehensive details on the development of the questionnaire can be found in Lofthouse, Trimingham & Bhamra [16]). The fact that 89% of the respondents to the questionnaire were female turned out to beneficial to the project as the product range selected by Boots for the remaining stages of the project was 'feminine body wash products' within the Botanics range (outlined below). Consequently respondents were on the whole representative for the average consumer in this market segment that was selected.

Following on from this, a series of educational activities, creativity techniques and design activities were combined together to form the 'creative workshop' programme, which drew on the insights of the questionnaire. Its aim was to (1) encourage invited practicing designers to think about the different types of refills available (2) outline the attributes of body wash products (3) feed in other sources of inspiration (4) provide the group with the time to generate ideas which met the refillable packaging systems brief [17]. In order to meet these requirements, a series of activities, generated from a range of external stimulus[18–21] were combined together to create the ½ day 'creative workshop' illustrated in Figure 2. (Further details can be found in Lofthouse, Bhamra & Trimingham [22]).

[Figure 2]

As a result of these workshops, a wide range of ideas for delivering body wash products via refillable packaging systems were generated. Figure 3 illustrates four diverse examples and provides an overview of their intended functionality. The 'test tubes' concept (highlighted in bold) was selected by Boots to be taken forward as it was felt it had the greatest potential for the successful delivery of body wash products and aligned well with the 'Botanics' brand. In order to make the outputs relevant to the industry partner it was important that they could see the potential in the approach selected.

[Figure 3]

The selected concept is an example of refillable packaging where the concentrate is mixed in the parent pack (CMPP). Two different ways of delivering the concentrate were considered. Concept 1 consisted of a water soluble sachet containing the concentrate (see Figure 4) which could be added to an empty bottle and then dissolved with by tap water.

[Figures 4]

This concept was considered to be the ideal delivery mechanism from an environmental perspective, because the secondary packaging of the refill would dissolve (and would not need to be disposed of responsibly by the user). However in case the novelty of the dissolvable packaging confused or alienated the customer it was felt that there was value in testing other approaches alongside. In Concept 2 the concentrate was delivered via a sachet, an existing stock item typically used for face masks, familiar to existing customers

(see Figure 5). In this instance the concentrate was delivered by ripping the top off of the sachet and then pouring it into the pump bottle.

[Figures 5]

In both concepts, once the concentrate had been added to the bottle, it was topped up with tap water and shaken to mix. The diluted product was then delivered through an existing foaming pump bottle containing a mechanism which converts the fluid consistency of the shower gel mixture into foam. The foaming technology meant that the product lasted 3 times longer than a standard shower gel. This approach also requires a reduced level of surfactant (a substance which tends to reduce the surface tension of a liquid in which it is dissolved), thus having additional unforeseen environmental benefits.

The prototypes were trialled with 16 target consumers (female customers, aged 21-40) in two multi-activity focus groups (including a simulated sales area, product evaluations and group discussions). The aim was to determine consumer appeal, levels of engagement and acceptance, and to identify which elements they instinctively understood and those which needed to be explicitly explained [9]. To ensure that participants were candid in the opinions, techniques such as 'the voice of the customer'[1] were used [23]. Data was collected by video and audio recorders, and after being transcribed, qualitative analysis was carried out by hand using a 'coding and clustering' method [24,25] and key findings were pulled out.

The quantitative Eco Indicator 99 tool [26] was used to assess the environmental performance of the two concepts against an existing Botanics shower gel product (a 200ml blended polymer tube with a snap fit PP cap) (see Figure 6) over a six month period.

[Figure 6]

The Eco Indicator, developed by Pre Consultants B.V.[27], is a life cycle analysis tool which quantitatively assesses the impact of a product or system, using over 200 pre-defined 'eco-indicator values' for common materials and processes [26]. It provides a quick assessment of a product or systems with respect to its impact on:

- Damage to human health
- Damage to ecosystem quality
- Damage to resources.

It allows designers to make a quick but also very detailed quantitative assessment of a product throughout its lifecycle [26]. The Eco Indicator is an effective tool for analysing the different life cycles of refillable packaging systems against standard packaging.

Each packaging concept was assessed in terms of:

- material used in packaging, by weight
- transport weight

[1] 'Voice of the customer' is a term used to describe the in-depth process of capturing customer's expectations, preferences and aversions, typically through the encouragement of candid discussions using discrete cameras and microphones.

- material, by weight, to landfill
- recycled content, by weight

An Eco Indicator table was completed for each concept and for the original packaging. This is a table that lists the material or process, the amount (e.g. kgs, kwh, tkm), the 'eco-indicator values' and the 'ecopoints' (the overall impact score), for each aspect of the lifecycle. In order to do this, the first step was to separate each product into its constituent parts. These parts were then added to an Eco Indicator table along with any processes involved in their manufacture. The Eco Indicator table is split into three sections:

- Production: raw materials, processing and manufacture (e.g. PET, injection moulding).
- Transportation: transportation of the product, energy in use and consumables in use (e.g. shipping, batteries).
- Disposal: landfill, recycling.

Each part was then weighed and this data was also added to the table along with the corresponding Eco Indicator values. Then the weight of each component was multiplied by the Eco Indicator value to give its 'ecopoint'. For an example section of the eco-indicator for Concept 1 see Figure 7.

[Figure 7]

The following assumptions were made; that 20 washes equates to one month's supply, that 150ml of product delivered by a foaming pump lasts approximately 50 washes, that 200ml of shower gel lasts approximately 20 washes. These assumptions were based on internal data provided by Boots. Water usage was ignored as it would be required for all concepts. In 6 months it was determined that the following amounts of material would be used:

- Concept 1: 1 x 150ml pump bottle, 3 x sachets and one tub
- Concept 2: 1 x 150ml pump bottle and three sachets
- Original pack: 6 x 200ml tubes containing traditional shower gel

4 RESEARCH FINDINGS

Through the research programme a range of insights regarding how best to design refillable packaging systems have been identified. Section 4.1 reports on the findings relating to refills in general, which emerged through the 'background research' and the 'consumer focus groups', specifically consumer insights, functional requirements and marketing considerations will be considered. Section 4.2 then looks specifically on CMPP refills, which were considered in more depth through the 'consumer focus groups' of the user testing phase. Consumer perceptions, environmental insights, marketing considerations and how this type of refillable packaging responds to and addresses previously identified business drivers and barriers [13] will be reported on.

4.1 GENERAL FINDINGS

4.1.1 CONSUMER PERCEPTIONS OF REFILLABLE PACKAGING IN GENERAL

Consumers have very contradictory perceptions when it comes to refillable packaging, they report that they are easy/difficult to use; clean/messy; create less waste/more waste [8], and

as such the uptake of refillable packaging is a complex issue, and the way in which they are designed is critical to their success. The following sections will consider these issues in more detail.

4.1.1.1 WHY WE BUY REFILLS

The research showed that there are a number of reasons why people actively buy refillable packaging. Understanding these helps to inform the design process.

From a practical perspective, consumers will select refills if they use public transport when buying their shopping, as they are smaller, lighter and easier to carry home (e.g. coffee pouches), they are also valued if they take up less room in the home (e.g. spice packs). Refills are also actively sought if the delivery mode is easier than that of traditional packs. From a branding perspective, consumers will engage in the purchase of refills if they already have a good experience of the brand and associate it with good product quality. For example as part of their range Thierry Mugler offer 'Angel perfume' as a refill, findings suggest that consumers already loyal to this brand will continue to buy new refillable offerings. A few consumers identified that they would actively seek out refills to reduce their environmental impact, though this was caveated by the need for product quality, a well-recognised requirement of the green consumer [28]. Other drivers included reduced costs, such as those offered to customers who refill 'Ecover' detergent bottles in store; that it is the 'norm' for the product in question (e.g. door to door milk delivery) or that it is fun, as with the case of the PEZ sweet dispensers, where children keep and collect the dispenser and refill it with lightweight sweet packs.

Unsurprisingly it was seen that in the majority of cases positive attributes lead to repeat purchases and negative experiences deterred a repeat purchase. However the findings also suggest that as long as the refill is delivered well, people do not mind whether or not they are given a choice to participate in order to engage with a particular brand. This is a useful finding for businesses interested in changing the way that they deliver functionality.

4.1.1.2 UNDERSTANDING COST PERCEPTIONS

Research showed that customers have one of two perceptions when it comes to the cost of refills, that they are cheaper or that they *should* be cheaper than the 'original' product. This means that the price incentive is expected and therefore is a 'must have' attribute rather than a 'delighter' and as such if it is not delivered, customers are disappointed [29]. Literature highlights that merely satisfying customers fails to encourage loyalty [30] and that there is a need to move towards delighting them [31,32]. It was also seen that the price only becomes an issue if the quality is there. In other words, if the quality is not there, consumers will not want the product, even if it is cheap.

4.1.2 FUNCTIONAL REQUIREMENTS OF REFILLS IN GENERAL – THE DESIGNERS' ROLE

The positive and negative experiences which customers' report in relation to refills, can be clustered around three distinct areas; the design of the pack, the design of the system, and the quality of the dispensed product. The pack design falls under the remit of the designer; the system design, though strategic in nature is likely to have a degree of designer input and

the third area is outside the remit of design, falling under the remit of formulation teams. Considerations relating to these first two areas will be considered here.

From the data gathered it has been seen that it is essential that refillable packaging systems adhere to certain functional requirements with respect to pack design. These can be seen as guidelines for design:

- The refill process must be easy, as intuitive as possible and the process of fitting/ removing the refill must be inclusive (e.g. suitable for arthritic hands etc).
- Consumers want to be able to drain all of the contents of the refill. If this is not possible then transparent packaging should be avoided, as these 'dregs' are considered to be wasteful, which has a negative impact on perceptions of value for money.
- The experience should be clean and hygienic.
- Maintenance should be minimal or not required.
- Both the pack and the labelling must be durable enough for repeated use.
- The storage of refills within the home must also be considered.

From a systems perspective:

- The refill process must be easy and intuitive.
- The whole packaging must be seen to represent good value and although incentives for use are appreciated, they are not a necessity.
- Expensive refills aligned with a giveaway parent pack (known as the razor and blade model) were viewed negatively.
- Consumers also need to be reassured about how long refills will be available for, if they are going to be expected to invest (financially or emotionally) in part of the system.

4.1.3 MARKETING CONSIDERATIONS FOR REFILLABLE PACKAGING

A number of interesting marketing related issues regarding refillable packaging systems, emerged. Although some consumers in the study recognised that refills use less material, generate less waste to go to landfill, there is less impact through manufacturing and they reduce the amount of different containers going into shops, these facts were not intuitive to all and as such if the environmental credentials of the system are to form part of the marketing programme, consumers need to be told 'what the point of it' is. That some of the consumers in the study have a level of awareness as to the environmental benefits of refills is another positive message for business.

In much the same way as with single use packs, the packaging and marketing must reflect the value of the product. It was clear that consumers relate very strongly to what they know - such as liquid tabs for washing machines, travel bottles, bath gems etc. and whilst this is beneficial as it helps to develop understanding, it will also influence how much consumers are happy to pay, as they know what they normally pay for products of this nature. As such they expect the same sorts of costs, despite the different format and the concentrated nature of the formulation.

4.2 FINDINGS RELATING TO 'CONCENTRATES MIXED IN PARENT PACK'

4.2.1 CONSUMER PERCEPTIONS OF 'CONCENTRATES MIXED IN PARENT PACK'

Only 25% of questionnaire respondents had experienced this type of packaging (indicating that this was a novel market approach) and the majority of their experiences, which related to fabric softener were reported as being 'good' or 'very good'. They cited the price, small volume and ease of use as the motivators. Through the consumer focus groups it was found that feedback about refills of this nature was generally positive – but there was a strong message that these types of refills MUST be delivered in the right way for them to be successful.

4.2.1.1 PERCEIVED VALUE

The different refill approaches illustrated by the two prototypes and trialled during the consumer workshops evoked very different responses from the participants involved in the focus groups, even though they produced exactly the same amount of shower gel which was delivered via identical pump bottles. Concept 1 was perceived as having added value through a combination of the small shiny concentrated *'pearls'* (PVOH refills) and the attractive storage tub which they came in. Concept 2 provoked mixed responses, ranging from being seen as 'cheap and cheerful', to being perceived as a 'high end product', depending on which products the participants associated it with. Luxury and quality were seen as positive qualities. Market research suggests that premiums of around 2% can be charged if consumers perceive additional product value [28].

4.2.1.2 COST/SIZE RELATIONSHIP

During the study, a number of interesting findings about the relationship between the cost and size of refills were identified. It was seen that if a refill is too small and looks 'medium end' (i.e. like a face mask) consumers do not want to pay much for it. However if it's really small and packaged well then they'll pay more for it – *'like a diamond'*. This illustrates potential for a wide range of design solutions to maximise both the consumer experience and profit margins.

It was also clear that consumers would not want to pay more for the product even if it was stated that it would last 10 times longer than they were used to. So although this is functionally achievable, it is not considered desirable. This finding has important implications for the development of refillable packaging. In addition to this it was identified that consumers do not necessarily want body wash products to last for many months at a time, as they like '*a change of flavour'* and get bored of the same product. Between 1 and 3 months was identified as suitable for personal care products of this nature. This finding may be specific to the attributes of the personal care market. However, from an environmental perspective this means that there are limits as to how efficient refillable packaging can be. For example, based on a concentration of 1:10, 75ml of concentrate would last the consumer a year and a half and would have to retail at £45. This issue can have real implications on what level of concentration is appropriate. For other product sectors, such as cleaning, this is likely to be more of an issue.

4.2.1.3 EFFECTIVE COMMUNICATION

The study identified that effective communication is critical to the success of refillable packaging systems. Labelling must clearly communicate all the key attributes, which can be extensive. As new pack types may be unfamiliar to the user it must be immediately obvious that a refillable system is being sold, in order to avoid customer confusion and potential increases in waste due to inadvertent disposal of refillable packaging. To mitigate against this it must be easy to differentiate between the refill and the original pack. There is also a need to communicate how the system works on both packs. All this is addition to meeting packaging labelling regulations. This is clearly a lot of information to communicate on a label and may have an impact on how small a refill cartridge can be. For the concepts generated, the label needed to communicate: that the refill was a concentrate; that water needed to be added; what the packaging is made of and what to do with it at end of life; exactly how to carry out the refill process; how the formula will mix and how long it will take; full use instructions; and how long the product will last for. The extensive labelling requirements would likely require the use of an expanded content label (which fold out to reveal a booklet), which would lead to additional costs.

4.2.2 ENVIRONMENTAL INSIGHTS

The key driver for developing CMPP refills is to reduce the amount of water that is transported, saving on materials and transportation costs. Figure 8 highlights the key findings when comparing the environmental performance of the two concepts against the original packaging over a 6 month period. Both concepts outperform the original packaging on all the key environmental issues for packaging design; materials selection, weight, and disposal. The greatest environmental benefit of the refillable packaging concepts come from the re-use and recyclability of the primary packaging, however this was because the original packaging was not recyclable. This could easily be addressed and so is not considered to be a key finding for this project. The second greatest improvement related to the amount of material (comprising the packaging and shower gel product) which needed to be transported, to deliver the shower gel to the consumer over a 6 month period. With respect to this an improvement of over 90% was identified for both concepts. This saving came about as a result of a combination of the massive reduction in the amount of water being transported, as a result of using a concentrate and the fact that the primary packaging was being reused. These two elements led to less material being used (approximately 60% less) over the 6 months period, which resulted in less weight being transported and less material being thrown in landfill (approximately 80%), all of which led to cost savings. All of these improvements can be summed up by the EcoIndicator 99 output which was reduced by around 50mPT in both cases [33].

[Figure 8]

There was not a great deal of difference between the environmental performance of the two refillable concepts – though this was mainly because of the heavy tub that was used to store the refills in Concept 1 (an available stock item). This is something which would be addressed if the concept went into production, which could lead to further environmental savings.

The study identify that there are a number of risks associated with refillable packaging. If consumers circumvent a refill system (by choice or otherwise) by always buying a new pack, any potential sustainability benefits would be lost. In fact this may contribute to an increase in resource and energy use compared to traditional packaging, since this type of packaging is likely to be more heavy duty as it needs to have a longer life. One respondent noted of his Thierry Mugler aftershave *'…you have to remember not to throw the bottle away otherwise product is useless'.* This is a key message for designers to take forward if this type of refillable packaging is to be successful form the environmental and consumer perspective. The reusable nature of the packaging needs to be clearly communicated both at point of sale and by some means once the product is being used within the home.

4.2.3 THE BUSINESS DRIVERS AND BARRIERS OF USING CMPP

In addition to the environmental drivers outlined above, further drivers for using CMPP included: reducing packaging costs; encouraging customer loyalty; new marketing opportunities; demonstrating responsible behaviour through reductions in the amount of waste produced; and that they fit within current supply chain models. Both concepts benefit from all of these positive characteristics.

A number of potential barriers were also identified: possible loss of brand lock-in, the need for an increased number of stock keeping units on shelves, increased costs associated with the need for two manufacturing systems, potential health and safety risks. Though the novelty of the approaches proposed at the moment limit the chance of losing brand lock-in as concentrates are so new on the market, there is still potential for this to become an issue in the future. In terms of the issues relating to increased costs and the need for increased room in store, these cannot be designed out. Finally the concepts do risk causing possible consumer inconvenience, though this will depend on how easy the bottle is to clean – an issue which could be addressed through good design. Additionally belief that refills are or *should* be cheaper than non-refillable packaging will have an impact on the business model selected to sell this (and any other) refillable system. The two concepts do however mitigate against over half of the potential barriers identified during the study, including; possible increase in use of resources, high initial cost and difficulty in maintaining enduring appeal, need for financial incentive, perception of being old fashioned; costs of refilling, costs of returning, costs of cleaning and costs of refurbishing packaging [34].

4.2.4 MARKETING CONSIDERATIONS

Refillable packaging systems will require clear communication to the customer at point of sale and as such are likely to require more space in terms of point of sale. Two further issues which were identified. The first involved potential issues around consumer perceptions of buying an empty bottle alongside the refills. This is something that would need investigating in more detail as it would be important for the environmental impact that consumers did not pick up too many 'free' pump bottles. The second issue concerned users desire to 'sniff test' fragrances in the store (especially for products like body wash). This would not be possible with current proposals and alternative in-store arrangements would need to be made. This again is may be an issue specific to personal care products,

but similar requirements should be taken into consideration when marketing other refillable products.

4.2.5 SUMMARY OF THE KEY GUIDELINES FOR DESIGNERS

In addition to the guidelines outlined in section 4.1.2, a number of additional guidelines should be considered when designing 'concentrates mixed in parent pack':

- It is critical to the success of the system that the consumer knows how to refill their primary pack.
- If additional product value can be achieved than market premium can be obtained.
- There is a complex relationship between the cost and size of refills, which creates a potential innovation space for designers developing this type of refill.
- Effective communication is critical.
- It must be easy for the consumer to differentiate between the refill and the original pack.
- It is important to communicate how the refill system works on both packs.
- The reusable nature of the packaging needs to be clearly communicated both at point of sale and by some means once the product is being used within the home.
- The concentrated nature of refills of this nature can mean that additional point of sale interaction is required to allow the consumer to interact with the product as they would with a single use product.

For body wash products and similar personal care products the following should also be considered:

- Although it is functionally achievable to create a product which lasts 10 times longer than current offerings, consumers were not willing to pay extra for this.
- Having access to a range and variety of fragrances was seen as desirable and being able to keep the same fragrance for a longer period of time was not seen as desirable.

6 CONCLUSIONS

The study reported upon in this paper aimed amongst other things to provide guidelines for the development of successful sustainable refillable packaging by better understanding consumer experiences. The findings from this study have contributed to understanding about the potential implications of refillable packaging and how it might be successfully utilised by business.

Through the use of high fidelity prototypes a much more detailed understanding of consumer perceptions and business challenges/ opportunities associated with 'concentrated refills that are mixed in the parent pack', has been identified. This has not previously been reported in the packaging literature. Despite the challenges it has been seen that in general this refill approach and the way it has been delivered has been well received by both consumers and the industrial partner. In addition to this both concepts

were seen to lead to considerable environmental improvements (as demonstrated using Eco Indicator 99) over the original packaging (over a 6 month period), with potential for even further developments with more detailed packaging redesign. The positive findings have served to demonstrate to the Boots project team that this type of approach is worth pursuing and as such feasibility research is on-going. It has been seen that if refillable packaging of this nature is designed carefully and applied to appropriate products, it has a great opportunity to reduce household waste and also reduce the amount of natural resources needed to package and deliver goods to the consumer. It is interesting to note that following the completion of this study, a number of products utilising this type of refill approach have been commercialised (e.g. cleaning products by SC Johnson and iQ[35]) further demonstrating their appeal.

There are a wide range of business and sustainability advantages to engaging with refills, if consumer needs can be met and the systems be designed to work effectively. It is however, critical to effectively communicate refill systems to the consumers to ensure that positive attributes of the product are promoted (e.g. that this approach will actively save them money) and negative attributes are mitigated against (e.g. that customers know it is easy to refill, not messy, not expensive etc.). It is also critical to ensure that customers know that they can and should refill their product, and that they know how to do it. One clear limitation of the study is that the research carried out in this project was UK centric and consequently caution should be exercised when looking to transfer 'consumer centric' findings to other markets.

Although refills are not the definitive answer to the future sustainability of packaging, this research has shown that they have a strong role to play as a strategy in a move towards a more circular economy, if they can perform for the consumer, the environment and business. This means they must offer good quality; be very easy to use and appropriately delivered; be clearly communicated; be offered through a brand consumers like; and represent good value whilst radically reducing the amount of 'stuff' produced and moved around. Incorporating carefully considered consumer and environmental needs into the design brief is likely to be critical to the successful development of refillable packaging.

The work presented in this paper is amongst very few studies which actively consider the desires and aspirations of users in the development of solutions for the Circular Economy, where traditionally the focus has been on the technological solutions (e.g. 'biocycle', 'technocycle')[36]. The findings from this study illustrate the complexity of user requirements for one single product type, which suggests that further work needs to be carried out across a range of product categories to understand the suitability of developing circular business models for other business-to-consumer product categories. This is an area of growing interest which is now being recognised by some of the key players in the field, as demonstrated by the publication of 'The Circular Design Guide' published by IDEO and The Ellen MacArthur Foundation[37].

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