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Consumer-focused Supply Chains: A Cross-case Comparison of Medicine Appeal and Acceptance in India, Uganda and Nigeria

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Consumer-focused Supply Chains: A Cross-case Comparison of Medicine Appeal and Acceptance in India, Uganda and Nigeria

Abstract

Medicine adherence levels remain frustratingly static at 50% or lower (Sabaté, 2003). We believe that supply chains can contribute improvements by making appealing and acceptable medicines available to consumers.

We use Service-Dominant Logic (Vargo & Lusch, 2004; Vargo & Lusch, 2008) to investigate consumption – the “last yard” of the supply chain – and empirical research performed in India, Uganda and Nigeria to assess how different populations view the formulation and packaging of Oral Rehydration Salts. The results and analysis provide new and actionable insights into medicine appeal and acceptance in the developing world.

Keywords: medicine acceptance, medicine appeal, product design, supply chain, service-dominant logic

Main Subject Text

The challenge

Medicine adherence levels remain frustratingly static at around 50% in the developed world (Brown & Bussell, 2011) and are likely to be lower in the developing world (Sabaté, 2003; Marcus, 2013). The World Health Organisation (WHO) has endorsed the idea that increasing adherence “may have a far greater impact on the health of the population than any improvement in specific medical treatments” (Sabaté, 2003, p.xiii).

The study of adherence improvement has historically focused on increasing motivation through behaviour change (Kreps et al., 2011). However, there is some awareness – though little research – that other factors are important, including medicine appeal (Davis, 2007) and acceptance (Murray et al., 2009; Shapiro et al., 1986). Together, appeal and acceptance determine whether medicine is acquired and consumed, hence whether patients are adherent and so can derive value from it. Appeal and acceptance are particularly relevant where there is a higher degree of consumer choice regarding choice of treatment.

The treatment of diarrhoea in under-fives in developing countries is a good example of this. Acute diarrhoea is the second largest cause of death in children worldwide, causing 1.2 million deaths globally each year (Black et al., 2010). In 2004, WHO recommended the use of zinc and low-osmolarity Oral Rehydration Salts (ORS) as the best treatment for uncomplicated diarrhoea (WHO/UNICEF, 2004). These two products together could rapidly and cost-effectively avert most deaths not prevented by vaccines (Fischer

Walker et al., 2011). However, only about 30% of children with diarrhoea in high-burden countries receive ORS, and fewer than 1% receive the optimum treatment of ORS combined with zinc (Santosham et al., 2010); a total of 67% of children receive potentially harmful treatment such as antibiotics, anti-motility drugs, or home remedies. Analysis of national household survey data (2005-2011) for the 19 high-burden countries shows that the majority of treatment-seeking for diarrhoea occurs in the private sector (retail stores and pharmacies). Making more appealing products available in this sector presents an opportunity to significantly increase adherence.

The key challenge presented here is the need to design, present and market ORS and zinc products that have optimum consumer appeal (price, good taste, correct volume, appealing packaging), to move consumption away from incorrect treatment. Whilst both ORS and zinc pack designs were tested in the study, in order to give depth of results this paper focuses on the ORS findings.

Theoretical basis for the research

This section first considers factors affecting the decisions to consume, recognising that all consumption is controlled by internal and external drivers. Adherence is then introduced. Service-Dominant Logic (SDL) is then presented as a means to position the factors affecting consumption. Finally, consumption is shown to be relevant to supply chain management by establishing it as the “last yard” of the supply chain.

“A Social and Economic Theory of Consumption” (Ilmonen, 2011) includes a review of the meanings of consumption. The value potentially obtained from consumption is not just determined from the offering itself but also from the experiences of the consumer and the perceptions of others. These personal experiences and external perceptions may determine whether consumption takes place or not, and if it does take place then in what way and in which circumstances. This suggests that all forms of consumption can be thought of as being determined, or controlled, by various internal and external forces.

Adherence (sometimes called compliance) is defined as “the extent to which the patient's medication-taking history corresponds to the prescribed drug regimen” (Urquhart, 1999). This regimen may be specified by a prescription, standard treatment guidelines (STG), the health professional's instructions, or other official communication. However, consumption theory indicates that the regimen is just one of the external forces determining consumption. Adherence is therefore a form of controlled consumption, where the regimen imposes the external control of frequency and timing but where other determinants also contribute to the decision to consume. According to a recent EU study (Ascertaining Barriers for Compliance Project, 2012), adherence is divided into three phases: initiation, implementation (persistence of consumption during the term of the

prescription), and discontinuation. The initiation phase represents the first decision to consume, and is where the two consumption determinants of medicine appeal and acceptance are most relevant. This applies to adult patients, but also to primary caregivers in the case of paediatric diarrhoea.

It is surprising therefore that a literature review performed as part of the EU study (Kardas et al., 2013) categorised no fewer than 771 individual factors affecting adherence, but only three of the 51 papers included in the review addressed initiation in any form (ibid., p.5). In fact, only a small amount of research has been performed on medicine appeal and acceptance in any of the three phases. Examples include Shapiro et al. (1986) considering acceptance of different tablet colours, Mennella et al. (2013) investigating drug taste, More & Srivastava (2010) looking at aesthetics of non-prescription medicines and their packaging, and ElMasry & Kipkeu (2010) investigating options for Coartem® packaging. These found that the appearance of drug packaging can indeed affect the initiation phase of adherence.

The thinking on adherence is well supported by the insights which Service-Dominant Logic (Vargo & Lusch, 2008; Vargo & Lusch, 2004; Lusch & Vargo, 2014) provides into consumer perceptions of value. According to SDL, consumption is better understood as co-creation of value in context by the consumer making use of the offering. The consumer exploits the affordances of the offering by exercising her agency within the constraints of her particular context (Figure 1). While agency, resources, contexts and constraints may differ even for different consumers in the same family, they will certainly not be the same across regions or countries. This implies that there is the potential for significant contextual variety (Ng & Briscoe, 2012) in any population that we consider, and it is therefore necessary to understand that when developing truly patient-centric products.

Much adherence research has emphasised the need to “change the patient”, implicitly placing the blame for non-adherence on a lack of motivation. However, the lens of SDL permits the value proposition of the offering to be investigated. In this case, the option to “change the offering” may be appropriate in order to address varying contexts. This therefore recognises the need for medicine packaging and formulation to be perceived positively by patients in order to enhance its appeal and acceptance (Figure 1).

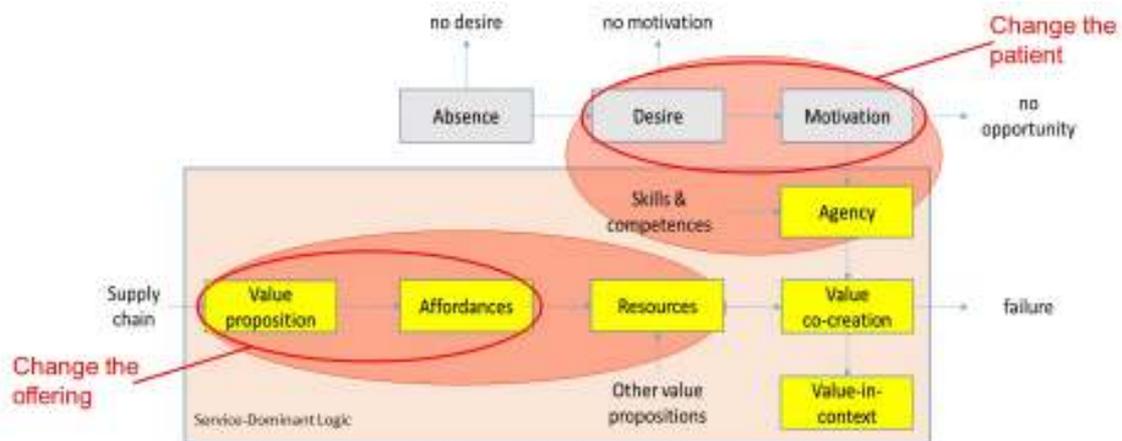


Figure 1: Adherence and "last yard" consumption using the lens of Service-Dominant Logic

Supply chain research (for example Bustinza, Parry, & Vendrell-Herrero, 2013; Hilletoft, 2011; Jüttner, Christopher, & Godsell, 2010; Stank, Esper, Crook, & Autry, 2012) has begun to highlight the necessity to understand customer needs and then to make them known to supply chain partners. Generally, however, research and practice has focused on the creation and delivery of the product and not on its consumption. This means that knowledge of consumers' use of the value proposition's affordances in context has not generally been utilised to improve the product and therefore adherence.

In an attempt to address this, recent work by one of us (Ward, 2014) has looked at how SDL can be used to "include the customer consumption and experience within the remit of supply chain management" (Ng et al., 2015) in order to improve value propositions they create. SDL "places the customer inside the system... [and] considers value co-creation in use as part of the provider's responsibility" (ibid.). The chosen approach has been to consider consumption to be the "last yard" of the supply chain, using a metaphor familiar to supply chain researchers and practitioners through analogues such as "last mile" and "last 50 yards".

In summary, adherence starts with initiation, and this decision to consume can be strongly influenced by the medicine's appeal and acceptance to the intended caregivers and consumers. Supply chain partners may not realise that they have the opportunity to influence adherence unless they recognise that adherence is not just about consumer motivation but also about product appeal and acceptance. The "last yard" metaphor helps supply chain partners to take the opportunities thus presented. With such insights, they can work to develop a deeper understanding of consumer value co-creation contexts so they can improve the designs of medicines and packaging for their intended consumers.

We therefore propose two hypotheses for this study:

- H1: Medicine pack design affects appeal and acceptance
- H2: Medicine formulation affects appeal and acceptance.

Methodology

The primary objective of this qualitative study was to explore optimal product presentations and product improvements for Oral Rehydration Salts (ORS), leading to higher caregiver adherence in India, Uganda and Nigeria. Desk research reviewed existing qualitative and quantitative studies on diarrhoea treatment behaviour, while interviews with key stakeholders including Non-Governmental Organisation (NGO) program leads, ORS manufacturers and regulatory organizations gave an overview of current products used to treat diarrhoea as well as perceived benefits and barriers to ORS usage. Following this review, concept development workshops generated ideas for product re-design and improvement. Fifty product designs were created. From these, three pack designs were chosen, plus seven new formulation concepts believed to represent best-fit options for addressing the five identified barriers: difficulty of preparation, difficulty of sourcing clean water, ensuring correct dosage, poor taste, and high product wastage. Figure 2 shows the three pack designs together with an ORS sachet currently on the market in Nigeria (pack designs were subtly altered for the three focus countries to align them with local ethnicities).



Figure 2: Examples of the three pack designs tested in the research, in design order, with an old pack from Nigeria for comparison on the left

The seven formulation concepts were: smaller powder sachet, effervescent tablets dissolvable in water, premixed liquid in a plastic bottle, premixed liquid in a Tetra Pak, premixed liquid in a soft plastic pouch, powder sachet with water purifier included, and powder sachet and zinc tablets packaged together in a “co-pack”.

These pack designs and formulations were then tested against the opinions of caregivers and healthcare providers from communities across India, Uganda and Nigeria. Quota sampling was used to recruit caregivers with children under five who had experienced an episode of diarrhoea within three months prior to the interview. The study included non-users of ORS, lapsed users and regular users. Sampling points were purposively selected

from rural, resource-poor districts with higher reported levels of diarrhoea incidence.

Interviewers took each caregiver through the formulation concepts and pack designs using a monadic sequential approach. Concepts and designs were first shown separately to evaluate their appeal, what in particular the respondents liked/disliked or would improve, their willingness to pay, and their purchase intent. Concepts and designs were then shown together to evaluate overall preference as well as their perceived ability to overcome the current challenges of the product on the market. Results from the interviews helped identify areas of focus for further discussion. Attributes that came out negatively or did not come out clearly were probed in more detail in smaller group settings.

A similar quota-based approach was used for the survey for healthcare providers, and this also relied on purposive sampling. Semi-structured interviews were conducted with drug shop owners, rural medical practitioners and community health workers at each respondent's location. Interviews included both open and closed questions to validate the caregivers' responses. Through this process a total of 630 caregivers and 119 providers were reached across the three focus countries. The breakdown is shown in Table 1.

Table 1: Respondent numbers by country and district

Country	State	Districts	Caregivers interviewed	Healthcare providers interviewed
India	Madhya Pradesh	2	60	42
	Uttar Pradesh	4	120	
Nigeria	Lagos	3	90	42
	Rivers	3	90	
	Kano	3	90	
Uganda	East	3	90	35
	North	3	90	

Results and analysis

The results of the surveys provide empirical evidence of both common and differing preferences across the three focus countries. They confirmed that common barriers to ORS adherence were indeed the five identified from stakeholder interviews. Differing purchase intent between countries was evident, although comparison of figures between countries may not be valid as caregivers may have different attitudes towards surveys.

Users, lapsed users and non-users showed no difference in response, and therefore the analysis is presented on total caregiver population. Results from healthcare providers were similar to those of caregivers.

We report first on packaging design appeal for ORS. Table 2 shows results for the three options. Across all three countries, the three packs were significantly preferred over existing designs on the market, and all achieved high ratings. These results confirm hypothesis H1: Medicine pack design affects appeal and acceptance.

In India, there was no statistical difference between the three package design preferences, with 86% of those questioned saying they would “definitely buy” each of the three designs. Comments indicated that designs should not look too expensive and should emphasise that the product will taste good. The respondents were highly price-sensitive. Current pack designs tend to be monochromatic and non-graphic, therefore all designs were considered attractive.

In Nigeria, designs 2 and 3 were both statistically preferred over design 1, with design 2 having the highest percentage of those questioned saying they would “definitely buy”. Comments indicated that a modern and “trendy” design was important. All three of the designs were considered by respondents to be more appealing than the current pack, but they felt the packs could be improved further in order to “captivate” them.

In Uganda, as in Nigeria, designs 2 and 3 were both statistically preferred over design 1, with design 2 having the highest percentage of those questioned saying they would “definitely buy”. Respondents indicated that design 3 looked as if the child was in danger by being swung by its mother, and that no medicine could work as quickly as the respondents inferred from the picture. In contrast, the child on design 2 looked healthy and happy, and in addition the words on the package were clear. Respondents also felt that the blue text on white background looked most “medical”.

Table 2: Average appeal scores out of 5 plus “definitely buy” purchase preference for the 3 package designs by country. Asterisked numbers for designs 2 and 3 are statistically significantly different ($p < 0.05$) from design 1

Country	Pack design 1	Pack design 2	Pack design 3	Purchase preference
India	4.85	4.85	4.90	N/A (all 86%)
Nigeria	4.49	4.65*	4.77*	Design 2 (78%)
Uganda	4.72	4.91*	4.91*	Design 2 (91%)

We now turn to ORS formulations. The respondents’ assessments of the seven options are in Table 3. The smaller sachet was popular in all three countries. Respondent comments indicated that this was due to it reducing

wastage and therefore being more economical. A consistent message from the interviews was dislike of the taste of the ORS. This may confirm bitter taste research (Mennella et al., 2013; Campbell et al., 2012) that has indicated a wide range of sensitivity in ethnically different populations on the African continent. Additional concerns about the taste of ORS incorporating water purifier were also common in all countries. Also consistent were issues with potential spillage of the premix in the soft plastic pouch. These results confirm hypothesis H2: Medicine formulation affects appeal and acceptance.

Table 3: Average appeal scores out of 9 plus purchase preference for the 7 formulations by country. Asterisked numbers are statistically significantly different ($p < 0.05$) from the smaller sachet

C'ntry	Smaller sachet	Efferv. tablet	Premix Tetra Pak	Premix bottle	Premix pouch	+Water purifier	Co-pack with Zn	Purchase preference
India	8.32	8.28	8.25	8.02*	7.64*	8.35	7.36*	Tetra Pak (43%)
Nigeria	7.39	7.67	7.52	6.76*	6.99	6.95*	7.01	smaller sachet/ Tetra Pak (27%)
Uganda	8.50	8.22*	8.48	7.89*	7.60*	8.25	8.45	Tetra Pak/ co-pack with Zn (15%)

Considering country-specific results, in India there was no statistically significant difference between the appeals of a smaller powder sachet, an effervescent tablet, a premix in Tetra Pak, and a powder sachet including water purifier. The other options were statistically less appealing, though all were preferred to the current product. When respondents were asked for their purchase preference, the most popular was the premix in Tetra Pak.

In Nigeria, the preferred options were the smaller powder sachet, the effervescent tablet, the premix in Tetra Pak, the premix in a pouch, and the co-pack with zinc. Respondents' purchase preferences were the smaller sachet and premix in Tetra Pak.

In Uganda, the preferred options were the smaller sachet, Tetra Pak, the sachet including water purifier, and the single packaging including zinc. The purchase preferences were the Tetra Pak and the single package including zinc.

Discussion

Our theoretical analysis of the three case studies using the lens of SDL provides potential explanations for medicine appeal and acceptance based on cultural and environmental factors. We have found a common set of factors with specific country differences which could permit the extension of the findings to supply chains for other medicines and potentially for other products.

It is clear that, as predicted from stakeholder interviews, there are multiple factors that lead a caregiver to decide whether a product is appealing. Firstly, even when caregivers are motivated to heal, they have differing levels of agency – that is, their capabilities vary. In India, for example, the respondents considered that the ORS/zinc co-pack was too complex for them (lack of personal competence), while in Uganda there was a strong need to demonstrate they were considering child safety (living up to perceptions of themselves or by others). Across the three countries, the most common agency issue was the lack of time that caregivers have available, which tended to direct them towards labour-saving premix formulations in the absence of price information.

Secondly, value propositions of resources other than those of the ORS take on different levels of importance depending on the context in each country. In Nigeria, for example, the overriding issue with the co-pack was that water still had to be fetched in order to complete the resources required to co-create value.

Third and finally, we turn to the value proposition of ORS in the three contexts. The research showed that appeal depends on the affordances of both package appearance and formulation. Considering appearance, while the new packs were preferred over the old ones it was found that packs must be different in different contexts in order to have maximum appeal. Considering formulations, the products offering the highest affordances – lower cost, premixed, with additional ingredients, acceptable taste, in a co-pack – held unsurprising appeal in general, but at a more detailed level the different combinations were considered to have different affordances in each country as a result of contextual variety. Caregivers were therefore seen to be comparing affordances of the offering against the availability to them of other value propositions (for example, clean water) and their own agency (time, money) in order to select their preferred compromises.

SDL therefore provides a framework that facilitates an understanding of what is happening in both the pre-consumption (appeal and acceptance) and consumption (value co-creation) contexts. It becomes clear that, while changing the consumer's agency can increase the likelihood of consumption, changing the product's affordances (packaging, formulation) is at least as important.

This is where supply chains can make a difference. Once the target context is understood in sufficient detail, a product's value proposition can be designed or refined so that its affordances achieve greatest appeal and acceptance in that context. Historically, supply chains have been reluctant to engage in the consumption space (Lusch, 2011). To facilitate this being considered part of supply chains' remit, the concept of the "last yard" has been coined so that supply chain managers are more able to accommodate the idea that consumers should be "integrated into the supply chain" (ibid., p.16). One impact of this current research is that the supply chains responsible for the ORS and zinc products in the three focus markets are already taking action to add new formulations and to change packaging designs in response to the findings.

Conclusions and further work

The contribution of this research is significant. It confirms the hypotheses that both packaging and formulation can affect medicine's appeal and acceptance, and therefore ultimately improve patient adherence. The results of the research provide practical guidance for supply chains on how to enhance the initiation and implementation phases of adherence by provoking purchase and encouraging persistence.

Considering package design, while it is clear that improvements can increase the appeal of medicine, design details may have to be country-specific for optimum appeal and patient-centricity. In other words, it may not be possible to address all aspects of contextual variety with a single global design. Specific design details can only be finalised when supply chains understand the contexts of the target markets.

We now move on to consider the formulations. The premix Tetra Pak option was consistently preferred. This addresses multiple concerns of caregivers in resource-poor contexts – the premix saves time, removes the need to fetch water, is robustly packaged, and is not unattractive to young children. However, associated supply chain costs may be higher than with sachets so this presents a challenge to supply chain partners.

A smaller, lower-cost sachet with improved taste, which would lead to reduced wastage in use, was universally popular. Though a smaller sachet may increase the cost of packaging, it is one of the most cost-effective changes to bring to market. This research suggests that bringing a smaller sachet size into the private market (where the majority of caregivers in the focus countries seek treatment) will have a significant impact on adherence. There is a need for further research to understand the causes of the bitterness issue. However, combining these consistent findings on sachet size and taste indicates that a smaller-sized and better-tasting ORS product would be significantly more appealing and therefore be likely to improve adherence.

To date, results have been presented to local manufacturers and importers across the three focus countries. In Uttar Pradesh, India, the government is implementing pack design improvements for their ORS sachets at public health facilities (Figure 3(a)). Uganda currently has two local suppliers introducing the smaller sachet (Figure 3 (b)), two implementing pack design improvements and two suppliers launching a combined ORS/zinc pack. Nigeria now has five suppliers with co-packs on the market (Figure 3 (c)), two have implemented pack design improvements, and one will introduce smaller sachets in the longer term.



Figure 3: (a) New Indian ORS sachet, (b) New Ugandan ORS sachet, (c) New Nigerian co-pack

We believe that the approach taken in this research may also provide a new framework for assessing medicine appeal and acceptance more widely. In addition, it is likely that the same approach can be applied across other product groups such as pre-packaged food.

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