ILLUSTRATING THE COMPETITIVE DYNAMICS OF AN INDUSTRY: THE FAST-MOVING CONSUMER GOODS INDUSTRY CASE STUDY

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ABSTRACT

There are some industries whose strategic innovations are easier and faster to replicate because the products are mostly commodities, one of such industries is the fast-moving consumer goods industry (FMCG). In the fast-moving consumer goods industry, companies face a very difficult, if not almost impossible, task developing a competitive advantage based on differentiation or low cost strategies. The main reason is that competitors match or, even overtake innovations and costs reductions in a very short period. A case study illustrates the competitive dynamics of a market segment of this industry using a behavioral model (Morecroft, Lane, and Viita, 1991). The model captures the management team understanding of the competitive dynamics of the industry.

This paper contributes to the collection of publications that describe how models evolve and how management team's ideas are captured and mapped for understanding the dynamic complexity of businesses. It traces the development of a model all the way from issue conceptualization with the management team to the representation of their decision-making processes. The case study is based on a modeling project that supported the strategic launch of a new product in the fast-moving consumer goods industry. The product was aimed to establish a competitive gap between a company and its competitors. The modeling project was undertaken with a global multi-business firm with interests in consumer goods industries. The case study consists of two parts: a qualitative characterization of the strategic problem facing the company, and a behavioral model that replicates the managerial decision-making processes followed to develop the market for its new product.

The contribution of the paper for System Dynamics practitioners is to illustrate the dynamics of a highly competitive industry through the explicit representation of the main players in the industry.

THE MODELLING PROJECT

The modeling team consisted of two system dynamicists and a manager of the company. The management team consisted of senior managers from Marketing, Sales and Manufacturing, who were responsible for the development of the new product market. The project ran for one year having intermittent meetings with senior managers from different areas of the company to extract and validate the information required for the model. The process followed during the project can be summarized in figure 1.

The modeling project employed a system dynamics modeling approach as described by Sterman (2000) in Chapter 3. The essence of the modeling project was the continuous interaction between management and modeling teams in order to represent as close as possible managers' understanding of the strategic problem and the competitive dynamics of the industry. In other words, the model was a 'transitional object' for improving their mental models of how the competitive dynamics of the industry plays out.

The modeling project was oriented to answer the next question for the management team: "How can we grow and sustain our new product in the face of stiff competition?"

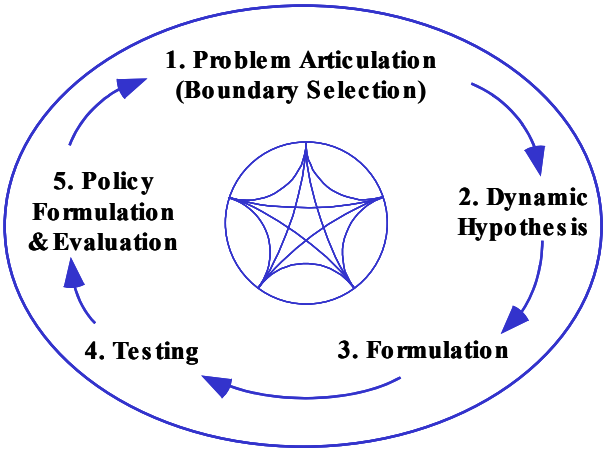

Figure 1. Project Methodology from Sterman (2000) (Ch. 3 p. 87)

CASE STUDY

Market Overview

While bar soap[a] has been the product leader in personal care since the beginning of this market, shower gels have been growing in the last years pushed by aggressive marketing campaigns and changes in life style, as figure 2 displays. This process has been occurring in a market whose volume has been stable for many years. Market participants have been introducing new variations aimed at the general market in an attempt to increase sales value. The introduction of new variations has been cemented on a more positive consumer attitude towards premium products than cheaper alternatives, as well as demographic and life styles changes. Buyers have also been able to afford increasing levels of spend on this market due to the continued increase in the levels of personal disposable income occurred in recent years. This situation played a vital role in determining the ability of suppliers to 'trade up' from lower priced towards premium products. Trading up has also been fuelled by new product developments offering value added benefits aimed at different lifestyles. In spite of all new product developments in bar soap, the general trend has been away from bar soap towards

[a] Since I cannot disclose the names of the firms and products of the case study, I use the information related to the soap market in the UK, another well-known market segment in the FMCG industry, throughout the case study to clarify grounded yet imaginary nature of the presentation. The focal firm is named 'VR-Cussons' (VR stands for virtual), its main competitors are named 'VR-Lever' and 'Own-labels'. The established product is named 'bar soap', 'shower gel' is the name for the substitute of the old established product, and 'liquid soap' is the label for the new product launched by VR-Cussons.

shower gels, as figure 2 shows, because shower gels offer more benefits to the user than bar soap.

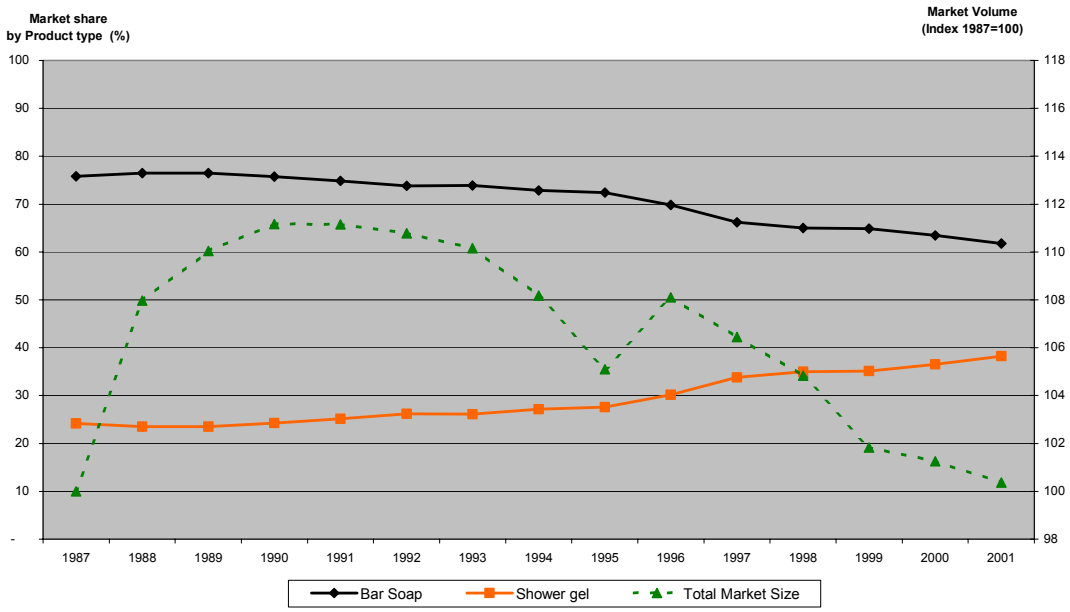

Figure 2. Total market volume and market share by product (1987-2001)
Source: Association of Manufacturers

The two main companies (VR-Cussons with 26% of market share and VR-Lever with 31% of market share) and the private labels (Own-labels with 16% of market share) account for most of the market in value terms. The market has always been brand driven, with the major brands investing huge amounts of money in advertising, but the private label products have also achieved some gains in market share in the last years. VR-Cussons has traditionally been oriented to bar soap, where it was the leader for many years. VR-Lever has been investing heavily in shower gels during the last years, as well as in bar soap, to obtain its actual leadership in the market. Own-labels only have a small participation in both types of product. We present a more detailed description of the main players in the market in the following paragraphs.

VR-Cussons It has been offering a steady stream of new product developments supported by high levels of advertising in bar soap – its core and traditional competence – as it faced more competitive pressure. VR-Cussons has brands that cover all the spectrum of the market, with some brands aimed at the premium end of the personal care market and other brands for price sensitive users. The company is recognized as an innovative leader in bar soap, but it lacks

the same strength in shower gels. Only recently, its management decided timidly to expand into shower gels rather than to be completely attached to bar soap.

VR-Lever Even though it was the newcomer to this market, the company has a long tradition in fast-moving consumer goods on a global scale. VR-Lever built up its participation in the market during 1980s and 1990s. The company entered this sector for the first time in mid 1980s when it acquired a well-known but small local bar soap brand in the UK market. In the 1990s it bought VR-Cussons' strongest rival. VR-Lever finished its global market share building process by acquiring the biggest supplier of shower gel in the world. In an interview published in 'The Economist', its Chief Executive Officer said that the company was keen to grow even bigger, and acquisitions had a role to play. He also added that acquisitions had always been part of the way of doing business, especially if they fitted strategically with the objective of being the leader in that area.

Similarly to VR-Cussons, the company has a range of products aimed at various lifestyles and consumers, but VR-Lever is not as innovative as VR-Cussons. VR-Lever only brings new products to the market when competitors introduce new developments.

Own-labels This concept describes the products developed by private labels of the multiple grocers and retailers. We decided to put together all the products from the retailers because they follow a similar competitive strategy in the industry (Messinger and Narasimhan, 1995) and their combined volumes represent the third biggest player in the market after VR-Cussons and VR-Lever.

Traditionally distribution-channel brands have had a low penetration in this market, around 8%. This was due to heavy advertising and promotional support for the branded products, coupled with buyers' preference for them. In the beginning of 1990s analysts predicted that the private label products were unlikely to increase their market share in the long term. However, a program of systematic upgrading and innovation increased their reputation among buyers, which produced rewards through 1990s, as some private-labels' market share grew steadily. Additionally, own-labels' products are priced between 5 and 10% lower than manufacturers' brands.

The Competitive Problem and Its Response

New product developments in bar soaps (an example of incremental innovation) have been driving sales value growth in the recent years, especially for VR-Cussons. However, new lifestyles trends have turned buyers to look for convenient products, helping shower gels to grow in volume at the expense of bar soaps. At the same time, the consolidation of their competitors through mergers and acquisitions pushed the company to timidly diversify into shower gels by acquiring a small company, which has a strong position in the premium end of the market but outside the mass market distribution channels. This was not the only response from VR-Cussons to increasing competition in the market. The case study describes the launch of a new soap product aimed at sustaining its participation in the personal-care mass market – a strategic innovation.

VR-Cussons' management tried to match the changes in buyers' lifestyles with a strategic movement towards liquid soaps. However, its main competitors offered similar products soon. For example, VR-Lever launched a similar product 18 months later. After launching liquid soap, most of the latest new product developments in the market had been directed to this category, some using different technologies but all of them aimed at improving the buyers' requirements in convenience and quality.

An Stylized Overview of the Management Team Understanding of the Market

We articulated the strategic problem with the management team during our initial meeting. After our initial meeting, we had a series of additional meetings with each of the managers to extract their conceptualization of the strategic problem. As we talked with them, we found different views of the strategic problem and decision-making processes involved in its solution. The lack of a common view might have generated inconsistencies in the strategies applied for developing the new product, but those different views were also important to identify additional influences on the growth path that had not been considered before this project.

The first version of the model derived from the initial meeting with the management team can be observed in figure 3. Figure 3 shows two conceptually separated markets: bar soap, where VR-Cussons faced the competition of various firms without any distinction between them. Therefore, customers were grouped using only one stock ('Other Competitors Bar Soap Volume'). The second market is the liquid soap market, where there would be an intense competition for acquiring initial users but, once potential users had been captured, they became completely loyal to the product and they could not be attracted by competitors' actions – there is no flow connecting both stocks of liquid soap customers in figure 3.

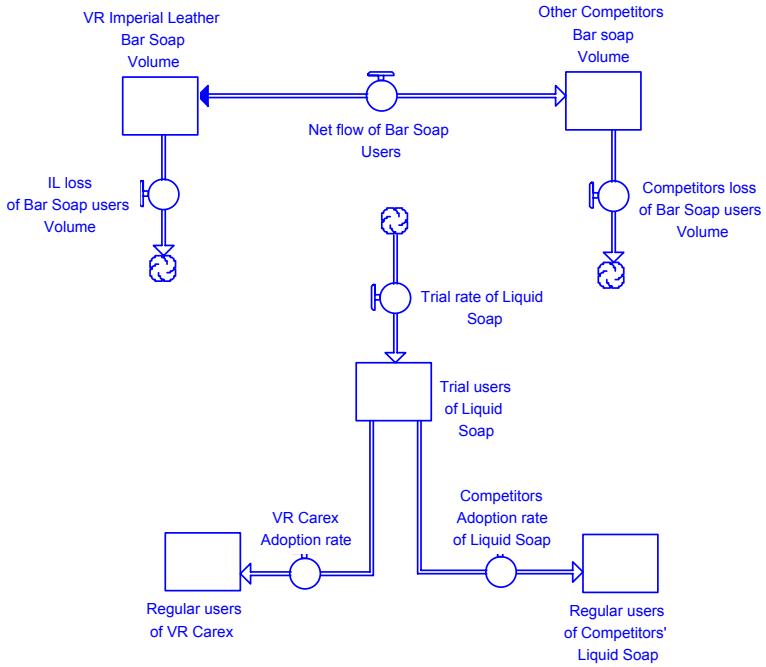

Figure 3. First representation of the management team's view of their market

Figure 3 uncovers three interesting issues during the initial conceptualization of the problem. First, the management team perceived both bar soap and liquid soap market segments disconnected from each other. Second, they have a simplistic view of the bar soap market. For example, the definition of competitors was blurred as the management team referred to them at an aggregate level; competitors were not clearly defined in managers' competitive schema. Additionally, users of bar soap were lost to "somewhere" in the personal care market. Since VR-Cussons' management had neither a special interest nor the capabilities to compete strongly on shower gel, the slow draining of customers to shower gels was not perceived. This 'blind spot' might have influenced VR-Cussons' subsequent innovation.

Third, the market for the new product was believed to be a simple adoption process. VR-Cussons management would bring consumers from "somewhere" to trialing the new product before becoming loyal customers of Liquid soap. These potential consumers would remain an uncertainty (stock 'Trial users of Liquid Soap') until they decided to adopt VR-Cussons or a competitors' new product. The strategic problem would be solved when trialing consumers became regular users of the new product, where VR-Cussons would have a first-mover advantage since it was the only firm with the technology to produce the new product.

In other words, the strategic problem was to contain competitors in the bar soap segment while the company built its leadership in the liquid soap handwashing segment. Then, liquid soap users would remain isolated from competitors' actions because of the initial first-mover advantage.

After in-depth interviews with senior managers, we identified additional relevant issues that modified the picture of the market represented in figure 3. Each player in the bar soap market faced a dynamically complex situation because they had to balance the attractiveness of their products, considering three different forces interacting at the same time, over their customers, as figure 4 displays. The forces were: a. the attractiveness of shower gels – a substitute –; b. the development of the liquid soap market, and c. the competitive actions of each competitor, such as consumer promotions or advertising, seeking to maintain their market share in the bar soap market – inter-firm rivalry. While VR-Cussons was interested in moving all of their customers towards the new product, it would want to do it without losing its share in the old product (because bar soap users were one of their main sources of revenue to finance the process of switching from bar soap to liquid soap).

Figure 4 displays the competitors' position in the liquid soap market. In FMCG markets, one of the key resources is the number of customers because sales volume influence on the ability for bargaining the share of other key resource (display shelf) with retailers. Their revenues also sustain the expenditure on advertising, which is necessary for building customer loyalty. Figure 4 shows the two market segments: old and new. In the old product segment, we represent, as asset stocks, the users of VR-Imperial Leather bar soap, VR-Dove bar soap and Own-labels bar soap (the unit of measure of each resource is the volume of product sold per month). VR-Imperial Leather users can emigrate to Own-labels products (if they are price sensitive), as flow 'Price sensitive IL bar users switch rate' represents, or to VR-Dove (if they are sensitive to value added benefits), as flow 'Branded bar soap users switch rate' captures. In the new product segment, we portray VR-Lever's and Own-labels' customers (stocks 'VR Lever Liquid Soap Volume' and 'Own Label Liquid Soap Volume') because they launched similar products in liquid soap products soon after Liquid soap. The initial expected effect of luring users of Dove bar soap directly into Liquid soap was not fulfilled because of the prompt reaction of its competitors. Therefore, the movement from bar soap users to liquid soap users for each company occurred mostly from their own bar soap customers, as flows 'Carex adoption rate', 'VR Lever Liquid Soap adoption rate', and 'Own Label Liquid Soap adoption rates' portray. Once these customers were using regularly liquid soap, they could switch to other liquid soaps. If customers were price sensitive, they would switch to Own-labels' products. Customers less price sensitive might switch between branded products.

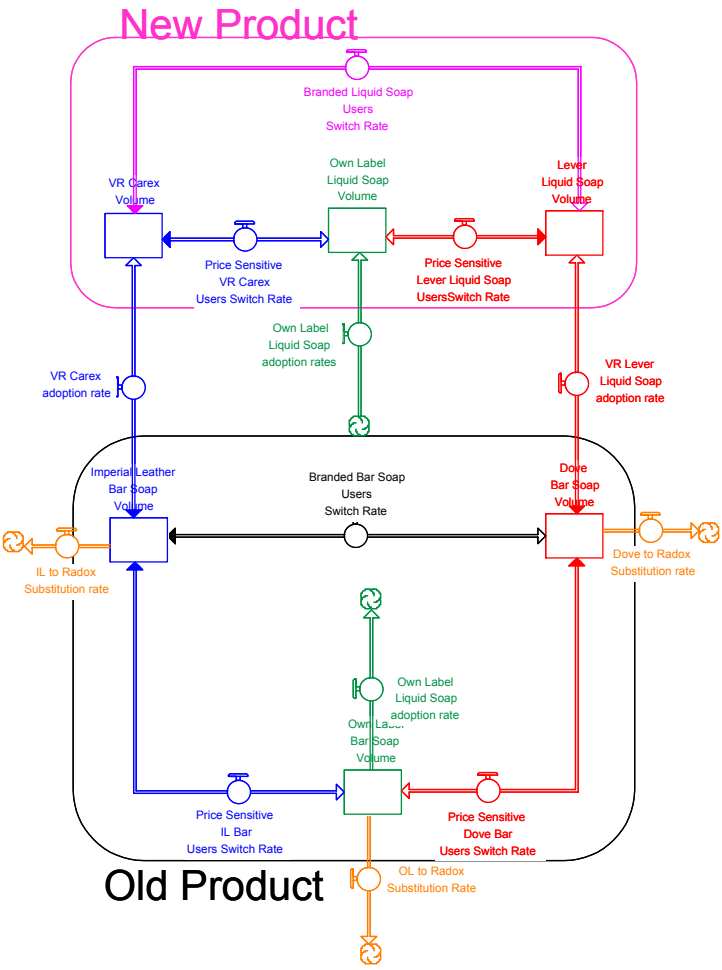

Figure 4. Refined management team's view of the market

The next step on our modeling project was to identify the sources controlling the flows from each asset stock representing consumers.[b]

The Model

The set of equations are based on the management's view of the industry and the sources of competitive advantage, as well as their decision rules to build the set of strategic resources and the operating constraints determined by the characteristics of the resources.

There are two main components in this model: (a) the system of resources; and (b) the managerial decision-making processes within the firm. Firstly, I describe the set of equations that characterizes the dynamics of the bar and liquid soaps market. Secondly, I describe the managerial decision-making processes responsible for controlling the system of resources.

[b] The full equation listing is available in the Appendix.

Bar Soap Market

The substitution process of the bar soap for shower gel is reflected in the outflow 'IL to Radox Substitution', which is controlled with the following equation:

*Shower gel adoption Rate i = Bar soap Volume i * s* (1)

Where the index i represents the different players in the market, *Bar Soap Volume i* reflects bar soap monthly sales in volume of a particular player, and *s* is a fixed percentage per month of the volume lost to shower gels. The fixed percentage, which has been defined by the management team, is a simplification of the process of change in consumers' preferences. The management team suggested that each bar soap user buys a similar volume of bar soap per month, and the bar soap consumption substituted each month for shower gels is a fixed percentage of the remaining customers. This fixed percentage describes two shared beliefs among them: one is that most of bar soap consumers would inevitable switch for shower gel; and the second is that all players in bar soap were going trough the same substitution process as figure 4 shows.

The management also believed that the bar soap market was commoditized so customers were very reactive to price differences among similar products, and advertising campaigns mostly helped to obtain short-term volume gains. Therefore, price and advertising determine the net flows between consumers using bar soap as equation 2 shows.

Net flow between firms = Consumers switching due to price + Net effect of advertising (2)

The price ratio effect between products was represented by the following equation:

Consumers switching due to price = ƒ(Effective Retail Price i / Effective Retail Price j) (3)

Where *Effective Retail Price i* is the suggested retail price less price discounts (consumer promotions) aimed to incentive the short-term consumption of the product. In spite of the different variations in bar soap, VR-Cussons' management team believed that there were not substantial differences in the characteristics of each players' bar soaps, so the model uses the average price ratio between two brands (including all the variations) to represent consumers' switching rate among them due to price changes. The comparison between average prices of two brands is represented using a function (see figure 5). This function is an aggregated representation of consumers' reactions to relative price changes.

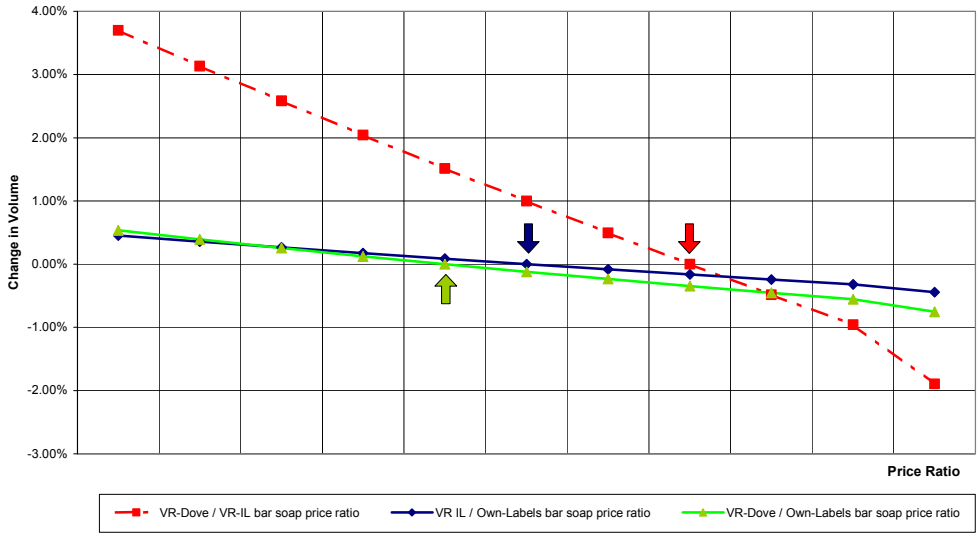

Figure 5. Price response functions in the old product market

The function *f(Effective Retail Price i /Effective Retail Price j)* was calibrated for each flow of consumers between two competing brands using the evolution of prices during the period analyzed. The effect of different value perceptions for competing products can be appreciated in the slope of the functions shown in figure 5. For example, the slope of the function for two products with similar perceived value (VR-Imperial Leather and VR-Dove) is steeper – dashed line in figure 5 – than a function that relates two products that customers perceive to have different value (VR-Imperial Leather and VR-Dove compared with Own-labels products) – light and dark solid lines. Therefore consumers were more likely to switch between two products perceived similarly rather than two products perceived differently, which implied that Own-labels needed to sustain bigger price differentials with respect to branded products to lure (avoid losing) customers from (to) branded products, as figure 5 shows. Another interesting information extracted from the historical data is the location of the average price point (see arrows in figure 5). The location of the average price point, which represents a 'null-switching point' in the model, suggests that the players in the market followed different pricing policies. In the case of VR-Imperial Leather and Own-labels, the average price is almost symmetric to both price extremes (dark arrow in figure 5), which indicates a more balanced price movement over time. On the other hand, the price ratio between VR-Lever and Own-labels is located slightly to the left (light arrow in figure 5), as VR-Lever tended to have its prices slightly higher than VR-Cussons. Finally, the average price ratio corresponding to VR-Imperial Leather and VR-Dove is located asymmetrically at the right indicating a clear trend towards lower rather than higher prices of VR-Imperial Leather bar soaps with respect to VR-Dove bar soaps.

The effect of advertising campaigns are represented as:

Net effect of Advertising =
*Total Market * [(Expected effect of advertising firm i * Effect of Share of Display i) – (Expected effect of advertising firm j * Effect of Share of Display j)]* (4)

Expected effect of advertising firm i =
f(SMTH1[c] *(Actual Expenditure on advertising firm i, Time to Forget Advertising)* (5)

Actual Expenditure on advertising firm i =
*Average Expenditure firm i * Firm i Effect of Market performance* (6)

Effect of Share of Display firm i = f(Share of Display Shelf firm i) (7)
where $0 \leq f \leq 1$

Where *Expected effect of advertising firm i* corresponds to the proportion of the total market (measured in volume) that will buy the product influenced by not only actual advertising campaigns but also past advertising campaigns as equation 5 shows. The investment in advertising has a residual effect on consumers purchasing behavior determined by the average time to forget the advertising campaign – 'carryover effect'. The carryover effect has two implications: the effect of an advertising campaign is not immediate but it is built over time, and it can last after the campaign has ceased. Figure 6 shows the shape and range of the function *Expected effect of advertising,* which relates the expected effect of the amount invested in advertising on the marginal increase in volumes sold. While high levels of investment in advertising have decreasing returns given by market saturation effects, low levels of investment in advertising have negative effects in consumer loyalty as people forget the brand name, as figure 6 portrays.

[c] SMTH1(<*input*>,<*averaging time*>) is a function of the modeling software ithink (High Performance, 2003). The SMTH1 function calculates a first-order exponential smooth of an *input*, using an exponential *averaging time*.

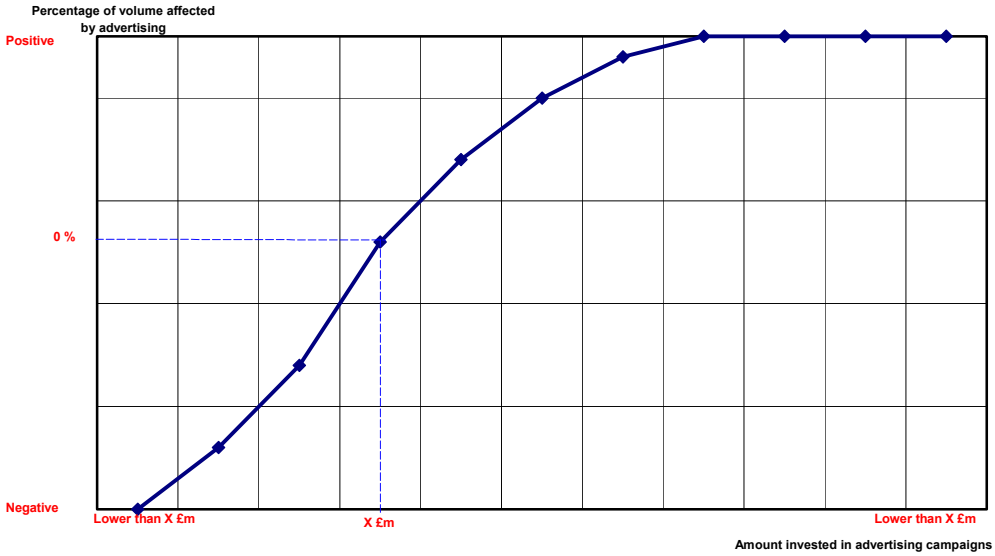

Figure 6. Expected effect of advertising function

The level of display of the brand in the market, which is measured in the model using the share of shelf space, also affects the effectiveness of advertising. Figure 7 shows the shape of the function relating the effect of share of display on the effectiveness of an advertising campaign. The effectiveness of an advertising campaign increases as the share of shelf space increases up to a limit determined by the saturation of the shelf space.

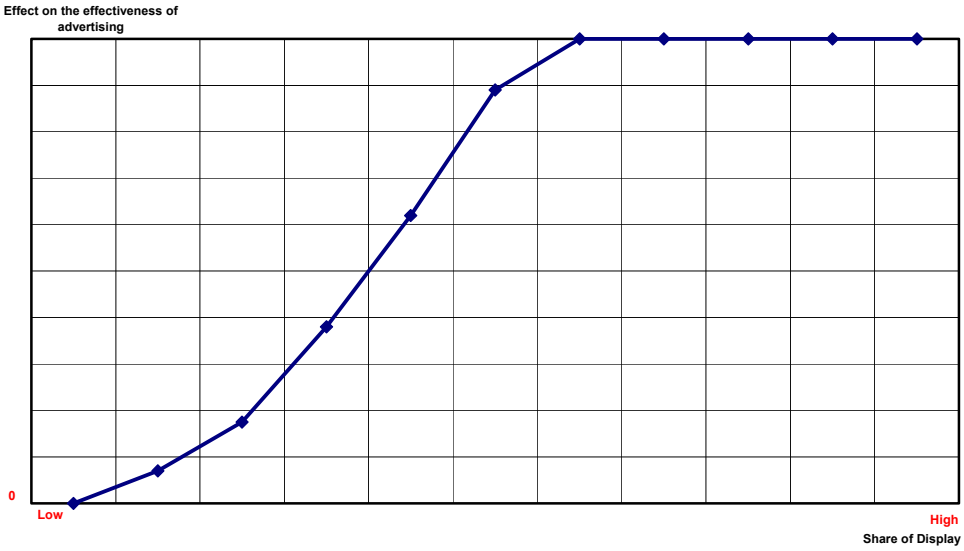

Figure 7. Effect of share of display on advertising effectiveness function

Liquid Soap Market Segment

In the liquid soap segment, VR-Cussons' managers faced another dynamically complex situation because they had to maintain its share in the new product market segment considering two different forces interacting at the same time as figure 4 displays. The forces

were: (a) the adoption process of liquid soap for handwashing by bar soap customers; and (b) rivals' competitive actions, such as consumer promotions or advertising, to increase their market share in the liquid handwashing products market as they try to close the competitive gap with VR-Cussons. In this case, VR-Cussons faced the difficult task of sustaining its leadership in the new market segment without eroding its revenues.

In the new product segment, there are two main flows: one is driven by the adoption rate of the liquid soap by the bar soap users, and the second is determined by the competition from rivals as figure 4 shows. The average price ratio between bar soap and liquid soap partially constrained the adoption of liquid soap products from consumers of bar soap, as equations 8 show.

*Market size liquid soap = ƒ(Liquid Soap Retail Price / Bar Soap Retail Price) * Total Market* (8)

Even though the characteristics of the liquid soap were better, the management team believed that one of the main barriers to change consumers' preferences from bar to liquid soap was the price differential between both products. Managers' beliefs are represented in the model using a function that relates the proportion of the total market willing to adopt liquid soap based on the ratio between liquid soap and bar soap prices (see figure 8).

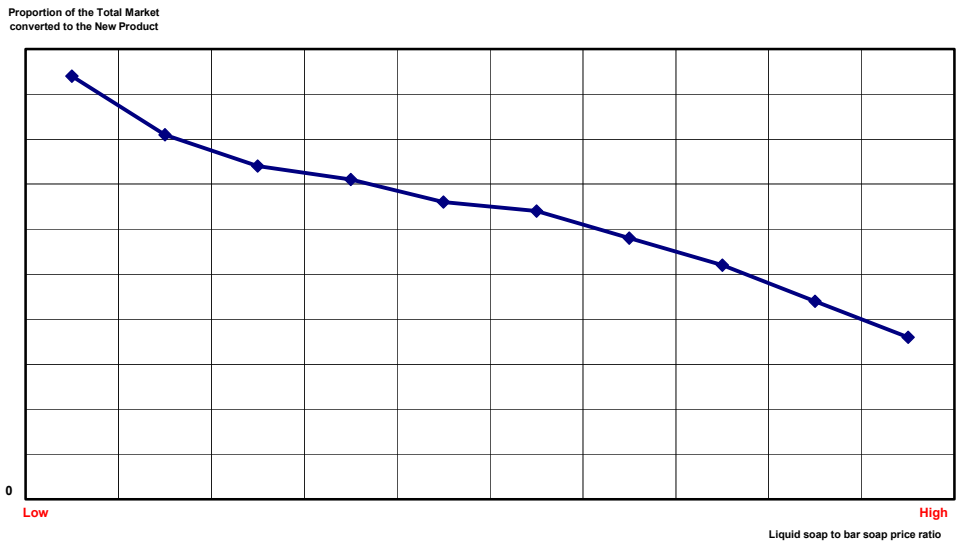

Figure 8. Proportion of total consumers that would adopt the new product as a function of its price relationship with the old product

Here again, there were two interesting strategic dilemmas for VR-Cussons. First, lower prices would imply a faster conversion of bar soap consumers and a bigger liquid soap market

size, but it would also mean low future revenues. Second, VR-Cussons had not enough time to develop the market as a premium version of the bar soap market because it was facing continuous losses to shower gels and VR-Dove.

Similarly to the bar soap segment, relative prices and advertising expenditure determine the net flow of customers switching between firms:

Net flow between firms = Consumers switching due to price + Net effect of advertising (9)

Consumers switching due to price = f(Effective Retail Price i / Effective Retail Price j) (10)

Net effect of Advertising =
*Total Market * [(Expected effect of advertising firm i * Effect of Share of Display i) –*
*(Expected effect of advertising firm j * Effect of Share of Display j)]* (11)

The equations used to describe the new product's price and advertising dynamics are similar to the bar soap segment. The only parameters of the model changed are those related to the responses of the consumers to changes in the average price brand ratio (these parameters have also been calibrated using the historical price time series). We can appreciate in the slope of the functions represented in figure 9 the effect of both different value perceptions and uncertainties among consumers of the new product (the maximum change in volume in liquid soap is almost 8% compared to only 4% in bar soap for products from VR-Cussons and VR-Lever). Similarly to the bar soap market, the slope of the function for two products with similar value for the buyers is steeper (dashed line) than the function that relates two products with different value for the buyers (light and dark solid lines). The location of the average price point is similar to the old product market (see arrows in figure 9), which may suggest the existence of similar pricing policies followed by VR-Cussons in both market segments once the market was stabilized.

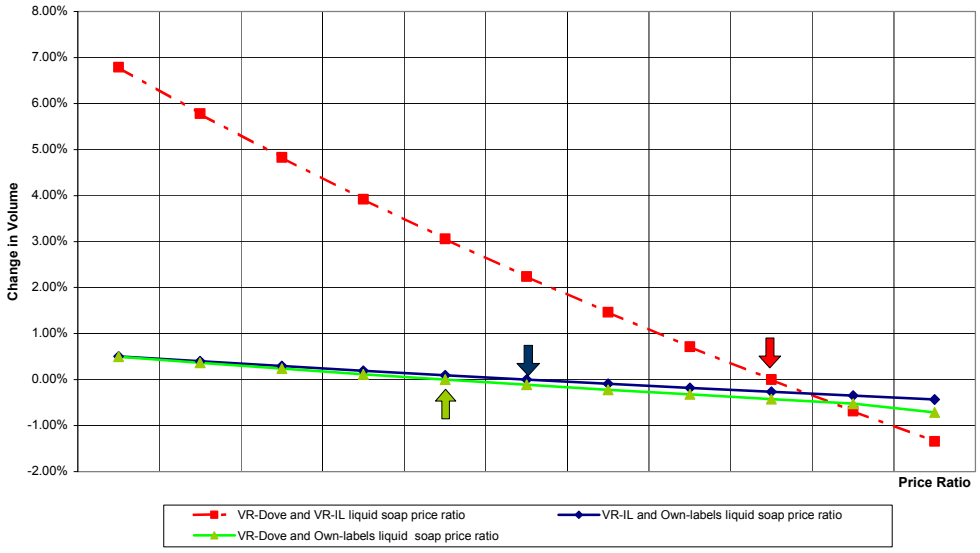

Figure 9. Price response functions for the new product market

To summarize, I presented a stylized representation of the old and new product markets that the management team of VR-Cussons faced. Customers are resources very difficult to control because their behavior can be affected by the competitive actions of competitors; however, customers are strategically important in fast-moving consumer goods markets because they provide revenues to sustain advertising as well as bargaining power to negotiate with retailers. Even though customers responses to price, advertising and the perception of values can be associated to different psychological characteristics of their personalities (Simonson, Carmon, Dhar, Drolet, and Nowlis, 2001), the feedback process between competitive actions and consumer behavior can also shape the outcomes that are observed in the market. The following section describes the managerial decision-making processes responsible for the competitive actions that have been affecting the evolution of the market.

Managerial Decision-Making Processes

In most realistic situations requiring decisions, the complexity of the dynamics of the resource system prevents managers from not only determining but also achieving an optimal strategy. Unable to optimize, managers exercise control through heuristics which may seem to be locally rational but globally uncertain (Morecroft, 1983; Morecroft, 1985; Sterman, 1987). The decision rules discussed in this section reflect in a stylized way the prevailing mental models used for selecting the information sources for decision-making. In that sense, I followed the Baker Criterion principles for modeling human behavior (Ch. 13, table 13.11 in Sterman, 2000). The Baker Criterion principles suggest that only inputs, which conform actual managerial practices, should be used in decision rules.

Managerial decision-making processes in VR-Cussons Two distinct views of the competitive problem in VR-Cussons existed at the beginning of the project: one view – sustained by the marketing manager – was related to the management of the customers through pricing and advertising; and another view – portrayed by the sales manager – defined features of the decision-making process affecting the allocation of shelf space and pricing decisions for the private labels of the retailers.

Marketing competitive actions were intended to influence short-term buying patterns through price discounts and advertising. The simulated decision-making process compares the actual volume with respect to the past volume and their differences determine the magnitude of the competitive response as shown in figure 10. The shape of the function captures the idea that marginal differences between actual and past volumes are insignificant for the managers of the firm. However, large negative differences result in more intense marketing actions such as bigger price discounts or more money available for advertising campaigns, and large positive differences result in less intense marketing actions in order to maximize operating cash flows.

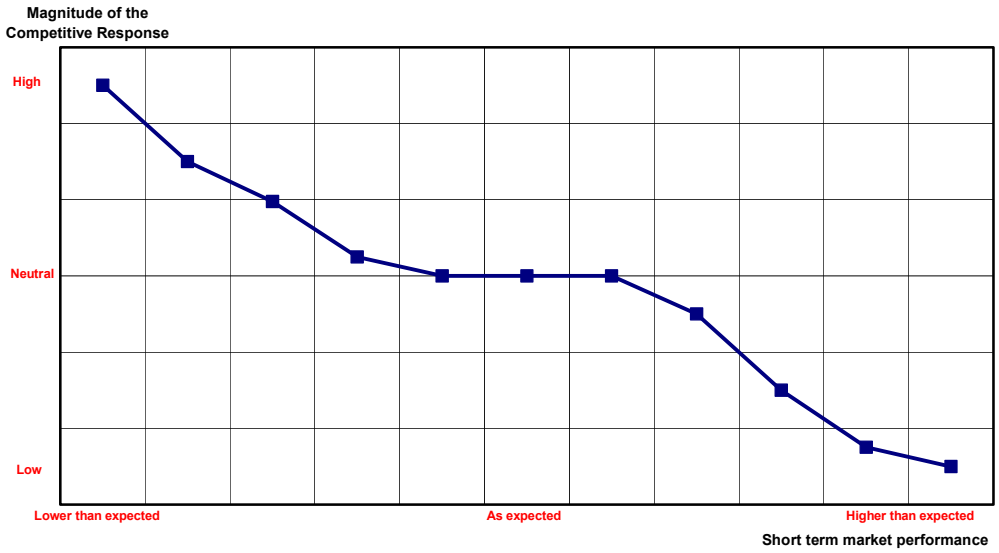

Figure 10. Function determining the strength of competitive response to market performance

The non-linear shape of the management response function described in figure 10 is consistent with previous research on behavioral decision-making research where subjects responded to changes in the level of a variable rather than on its final expected level (Kahneman and Tversky, 1979). When subjects respond to certain stimuli, the past and

present contexts of their experience define a reference point, and stimuli are perceived positively or negatively in relation to this reference point. While strategic goals are very important, in the short term managers review their actual performance with respect to past performance and act based on differences with respect to previous performance, as equations 12-16 formalize. The management response function was calibrated using the historical behavior of the retail prices and the intensity of advertising campaigns with respect to volume changes.

*Firm i Effective Price = Firm i Retail Price * (1 - Firm i Short term Consumer Promotions)* *(12)*

Firm i Short term Consumer Promotions = f(Firm i Effect of Market Performance) *(13)*

Firm i Effect of market performance = f(Firm i Short Term Market Performance) *(14)*

Firm i Short term Market Performance = Firm i Actual Volume/ Firm i Past Period Volume *(15)*

Firm i Past Period Volume = SMTH1 (Firm i Old Product Volume, Firm i Short term Horizon) *(16)*

The variable *Past Period Volume* reflects the reference point used for decision-making. Equation 16 shows that the adjustment of the reference point is defined by the periodicity of performance reviews within VR-Cussons; for example, firms that have quarterly reviews of performance update the reference point on a quarterly basis. The set of equations presented above (12-16) also portrays managerial decision-making as an anchor and adjustment goal setting process (Lant, 1992; Sterman, 2000), where the past period market volume – the anchor – adjusts over time based on actual market volume – the adjustment.

Consequently, the market performance response function, which reflects the comparison between actual and past volume performance, determines the intensity of the price discounts and advertising expenditures as responses of VR-Cussons management to changes in their market volume. Figure 11 displays the process of decision-making, as information feedback processes, related to pricing and advertising. The decision-making process can be described as a balancing feedback loop process controlled by a floating goal. The dynamics of the floating goal is determined by two counteracting effects: one is the evolution of the

performance with respect to past performance – solid line in figure 11 –, and the second is the effect of VR-Lever pricing and advertising on the achievement of VR-Cussons goals – dashed line in figure 11.

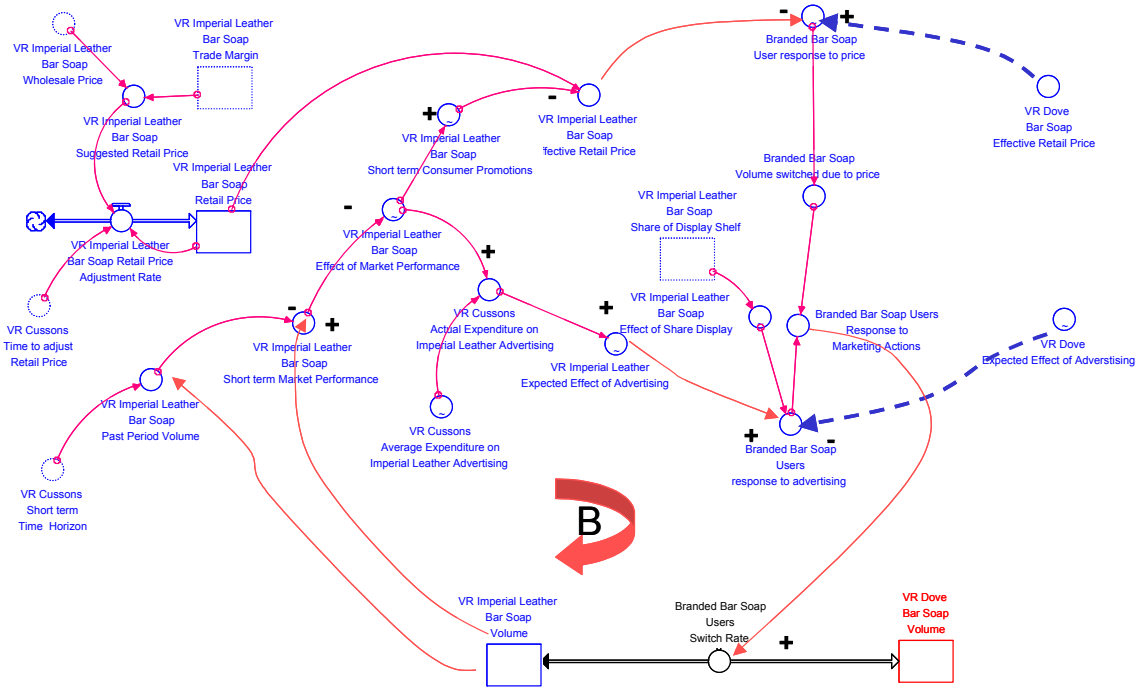

Figure 11. Pricing and advertising: Managerial decision-making process

The same structure is built for the new product market segment but with different values for the key variables such as 'Average Advertising Expenditure', 'Short Term Consumer Promotions', and the response magnitude function, which is known in the model as 'Effect of Market Performance'. Since different managers run the new and the old market segments, the functions relating market performance and magnitude of the response are different. While the manager of the bar soap had to manage a continuous decline in their market volumes, the manager in charge of liquid soap faced pressures to sustain its growth rate over time.

Interestingly, this characterization of pricing and advertising shows the lack of attention of VR-Cussons' managers to the actions of competitors in the market because they were focused on their own volumes rather than benchmarking prices or volumes against VR-Lever or Own-labels. In this stylized characterization of VR-Cussons' managerial decision-making, the price setting process is endogenous and depends on maintaining past volumes. VR-Cussons' prices will change only if sales volume falls dramatically in the short term (but if sales

volume falls continuously and at a small rate over a long period, the price will not change – as figure 13 shows –). However, competitors' goals may affect the evolution of VR-Cussons' prices. In this case, VR-Cussons price will oscillate with competitors' prices until both of them reach an equilibrium level, which will be determined by the time to achieve their organizational goals or adapt them to their market situation. The formulation used in this set of equations (price setting as an anchoring and adjustment process using past prices) is consistent with the principles of modeling bounded rationality (Sterman, 2000 Ch. 20).

The attention of the sales manager was directed to sustain a key resource in fast-moving consumer goods industry: the share of display shelf. The display shelf is a fiercely contested resource in the fast-moving consumer goods industry. While a bigger store size, which allows an increased number of items carried by stores, may reduce competition for shelf space, the proliferation of products makes retailer shelf space increasingly scarce and improves the bargaining positioning of retailers (Messinger and Narasimhan, 1995). One the one hand, the task of the sales manager is to maintain an important share of display shelf at the lowest cost because it can affect not only daily sales but also the effectiveness of future advertising campaigns.

On the other hand, retailers' management teams try to maximize the income received for the space allocated of the display shelf by assigning a high proportion to the highest profitable option. VR-Cussons management suggested that the main parameter influencing the allocation is market share and the relative trade margin offered. The equations driving the adjustment of the share of display shelf are:

$$\frac{dShare\ of\ DisplayShelf\ product\ j\ firm\ i}{dt} = \frac{Share\ of\ Display\ Adjustment\ (t)}{Time\ to\ adjust\ Share\ of\ Display} \quad (17)$$

$$Share\ of\ Display\ Adjustment = (Display\ Shelf\ as\ function\ of\ market\ share * Effect\ of\ trade\ margin\ on\ share) - Share\ of\ Display\ (t) \quad (18)$$

$$Display\ Shelf\ as\ function\ of\ market\ share = f(Total\ Market\ Share\ product\ j\ firm\ i) \quad (19)$$

$$Effect\ of\ trade\ margin\ on\ share = f\ (Trade\ Margin\ VR\ Cussons/Trade\ Margin\ VR\ Lever) \quad (20)$$

$$where\ \ 0 \leq f \leq 1$$

Figure 12 shows a stock and flow diagram of the managerial decision-making process used by the retailer for allocating shelf space to VR-Cussons. The decision-making process imagined by the management team is embedded in a reinforcing feedback loop process. They simply believed that higher market share (a relative measure of other key resource: consumers) implies higher share of display.

The full allocation of display shelf process plays out in the following way. Higher share of display improves the visibility of the brand which increases the effectiveness of advertising campaigns. Effective advertising campaigns help to augment market share and then the allocation of share of display grows even more. However, two effects reduce the strength or even stop the reinforcing process. First, a retailer will not allocate 100% of the available shelf (for a specific market) to only one brand, even though the brand may be the market leader, because it will give too much bargaining power to the manufacturer. Second, relative trade margins, which the market leader may try to reduce because of its perception of high bargaining power, can disengage even more the relationship between the share of display shelf allocated and market share.

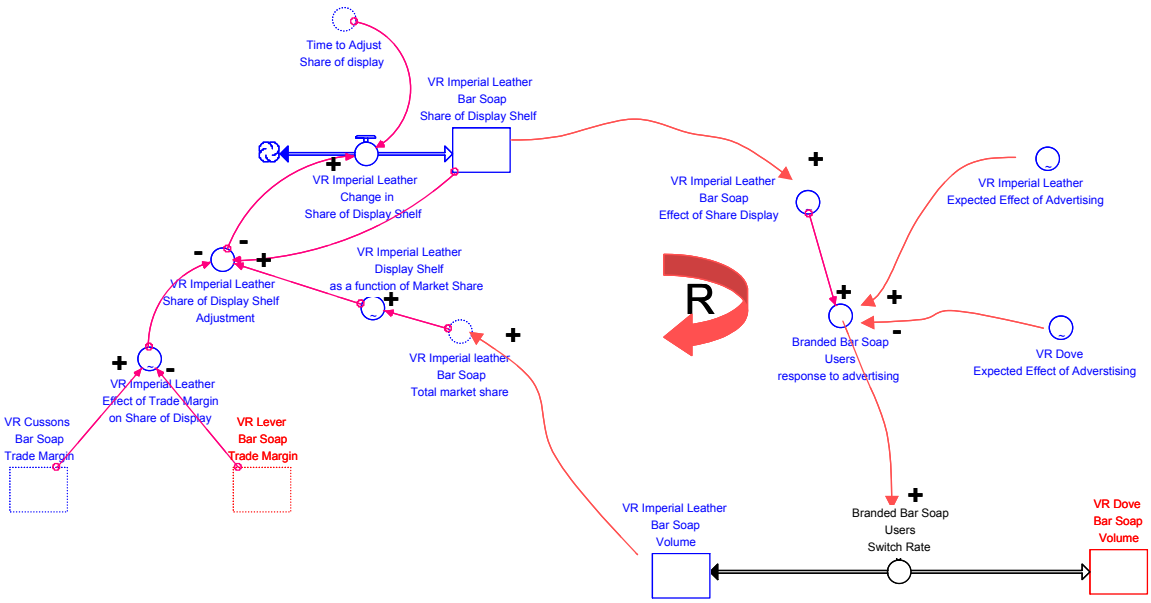

Figure 12. Allocation of display shelf: Managerial decision-making process

Consequently, the sales manager uses trade margin and market share (two important resources) to negotiate with retailers another resource: share of display shelf. The existing reinforcing process between share of display shelf and market share helps manufacturers to dominate the market through more effective advertising campaigns and higher bargaining power over trade margins. This tension between manufacturers and retailers drives the appearance of private label products in the FMCG industry, whose managerial decision-

making process is explored in the sub-section 'Resource and Managerial Decision-making for Own-labels'.

The manufacturing manager had a very important strategic dilemma: how to manage the allocation of manufacturing resources between the old and new product without incurring in inventory shortages or duplicating manufacturing resources. Since the new product needed a new manufacturing process, manufacturing capacity in the model is split into two different resources: manufacturing capacity for producing the old and the new product. The decision-making process for the adjustment of manufacturing capacity is driven by the evolution of the market size. On the one hand, the adjustment of the old product manufacturing capacity is determined by an anchor and adjustment process, the anchor is the long-term average volume and the adjustment is the actual sales (a very conservative adjustment), as equation 22 formalizes. On the other hand, the process for adjusting the manufacturing capacity of the new product reflects VR-Cussons' high expectations on the new product, as the rationale to expand the capacity indicates a simple extrapolation of the past performance over a future period deemed appropriate, as equation 25. The information related to actual capacities used for capacity adjustment is adjusted by a saturation threshold. Equations 21 to 26 define the dynamics of manufacturing capacity.

$$\frac{dOld\ Product\ Capacity}{dt} = \frac{-\ Capacity\ Adjustment\ (t)}{Time\ to\ adjust\ capacity} \quad (21)$$

$$Old\ Product\ Capacity\ Adjustment = Old\ Product\ Capacity - SMTH1\ (Old\ Product\ Volume, Capacity\ Planning\ Horizon) \quad (22)$$

$$\frac{dNew\ Product\ Capacity}{dt} = \frac{New\ Product\ Capacity\ Adjustment\ (t)}{Time\ to\ adjust\ capacity} \quad (23)$$

$$New\ Product\ Capacity\ Adjustment = Required\ Capacity - Actual\ Capacity \quad (24)$$

$$Required\ Capacity = [Actual\ Product\ Volume * (1 + Growth\ Rate * Expected\ time\ to\ reach\ capacity\ saturation)] \quad (25)$$

$$Growth\ Rate = TREND\ (VR\ Carex\ Volume, Time\ to\ average\ market\ information) \quad (26)$$

Economies of scale are commonly conceptualized as processes that drive costs down. For most firms competing in the FMCG industry, economies of scale are achieved when manufacturing facilities grow. Most people would recognize that economies of scale are embedded in reinforcing feedback loops: higher market share implies higher economies of scale that mean lesser costs and lower prices which reinforce the growth of the market share. This process can be observed in figure 13. However, the same process can also generate a spiraling downward process. When sales fall, costs per unit increases due to a lower output for the existing manufacturing capacity and other non-manufacturing fixed costs. Unless the firm has a very flexible manufacturing process in place and low non-manufacturing fixed costs (or easily adjustable) to maintain its gross margin, the management of a company will need to reduce the gross margin in order to maintain their actual sales. The process of gross margin adjustment is captured in the feedback loop 'Gross Margin Setting' shown in figure 16 – dashed line. After the launch of Liquid soap, VR-Cussons and VR-Lever were facing these two processes simultaneously: increasing economies of scale with the new product, and spiraling costs with the old product. Only Own-labels did not face that problem because they outsourced the manufacturing of their products.

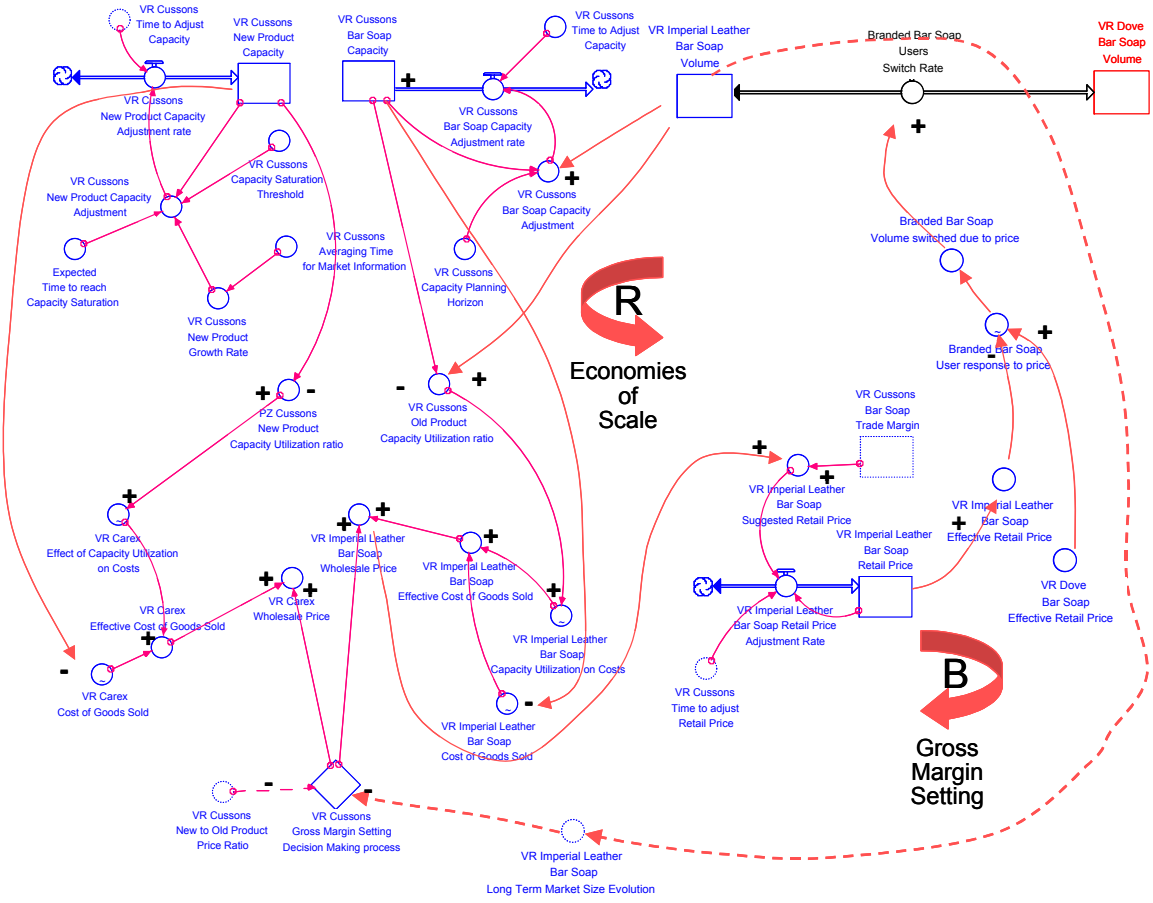

Figure 13. Manufacturing capacity setting: Managerial decision-making process

To represent the effect of economies of scale the model uses a function for the cost of goods sold, which includes all costs related to the production of a unit of product, based on manufacturing capacity (see figure 14). Additionally, the model contains a variable – 'Effect of Capacity Utilization on Costs' – to control the effect of the short-term adjustment process of manufacturing resources with respect to the volume of product sold. This variable penalizes, as a percentage of increment on the cost of goods sold, not only spare capacity but also too tight capacity utilization.

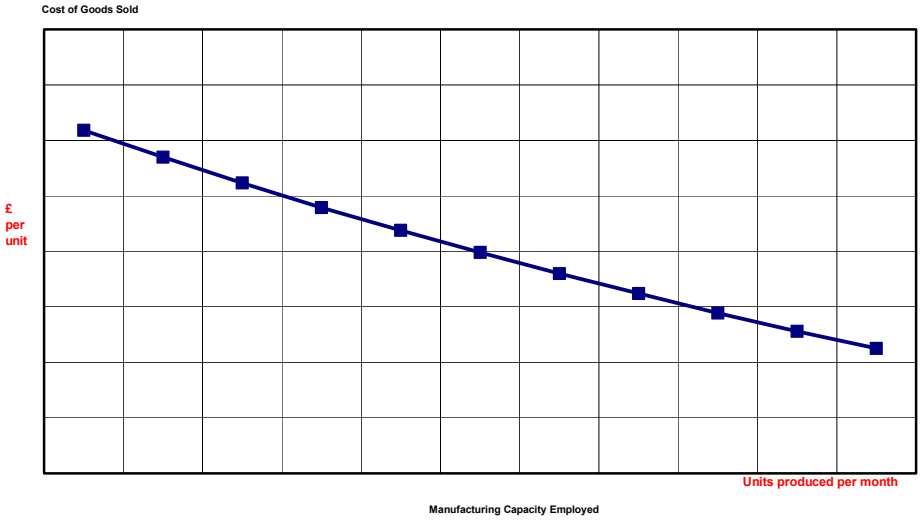

Figure 14. Cost of goods sold as a function of manufacturing capacity

VR-Cussons pricing decisions followed a "cost plus" rule where price was equal to the cost of goods sold plus gross margin. The gross margin adjusts as a function of the achievement of the long-term market size goal (equation 30). Interestingly, the company preferred to change the gross margin instead of adjusting its cost structure when long-term sales fell below their expectations.

Cost of Goods Sold product j= ƒ (Capacity product j) (27)

Effective Cost of Goods Sold product j =
*(1 + Effect of Capacity Utilization on Cost of Goods Sold) * Cost of Goods Sold product j* (28)

Wholesale price product j= Effective Cost of Goods Sold product j + Gross Margin product j (29)

Gross Margin product j =ƒ (Actual Market Size product j /Long term Market Size Goal product j) (30)

The dynamics of the market development process was strongly affected by the relationship between new and old products prices. If VR-Cussons launched the new product with a high price, only a small number of bar soap customers would become regular users of liquid soap. Therefore, the effect of the innovation in the market would be lost. While VR-Cussons' managers were willing to obtain a first-mover advantage in liquid soap, they did not want to set a price too low to erode their revenues. Thus, the future size of the liquid soap market was strongly determined by their actual pricing decisions, and the pricing decisions were affected by the attainment of the expected size of the liquid soap market. This dynamic dilemma can be represented by a balancing feedback loop, as figure 15 shows. Additionally, VR-Cussons management used two levers to convert bar soap users to liquid soap users: product trials and advertising. The effectiveness of these marketing actions was also related to the price of the product.

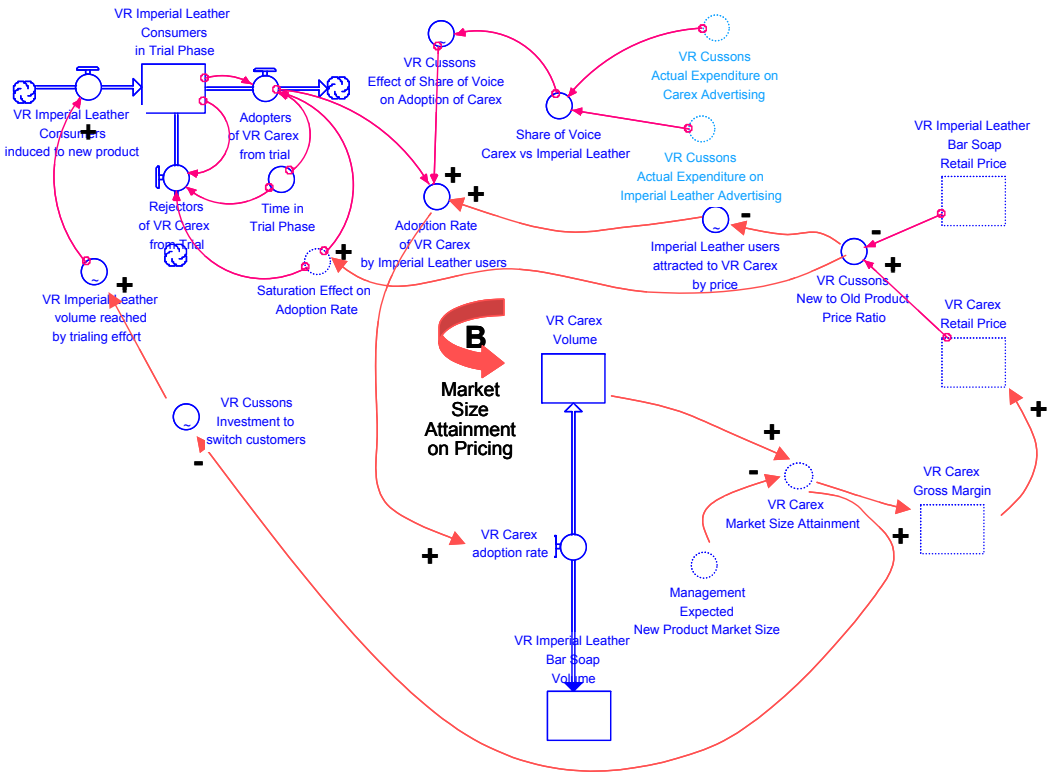

Figure 15. New product market development: Managerial decision-making process

The equations driving the new product market development are:

Adoption rate of VR Carex =
*Adopters of VR Carex from trial + Bar Soap consumers attracted by price * Effect of Share of Voice on Adoption Rate * VR Imperial Leather volume* (31)

$$\frac{dVR\ Imperial\ Leather\ Consumers\ in\ Trial\ Phase}{dt} = Induced\ to\ try(t) - \frac{(Adopters(t) + Rejecters(t))}{Time\ in\ Trial\ Phase} \quad (32)$$

*Induced to try = Volume reached by trialing effort * VR Imperial Volume* (33)

Volume reached by trialing effort = ƒ(VR Cussons investment to switch users) (34)

VR Cussons investment to switch users =
ƒ(New product Market Size/Expected New Product Market size) (35)

*Rejecters = VR Imperial Leather Consumers in Trial Phase * Saturation Effect on Adoption Rate* (36)

Adopters =
*VR Imperial Leather Consumers in Trial Phase *(1- Saturation Effect on Adoption Rate)* (37)

Consumers attracted by price = ƒ(New Product Retail Price / Old Retail Price) (38)

Resources and Managerial Decision-making Processes in VR-Lever VR-Cussons management team suggested, and additional qualitative information confirmed their characterization, that VR-Lever decision-making process was similar to VR-Cussons. Thus, we modeled VR-Lever using a similar system of resources but a slightly different decision-making processes than VR-Cussons.

Competitive marketing actions were employed when the actual market share of VR-Lever fell below their initial market share. Thus, VR-Lever only reacted to VR-Cussons' innovation when its participation in the liquid soap market fell below its historic market participation. The intensity of VR-Lever marketing actions follows a nonlinear function similar to VR-Cussons decisions rules (see figure 10). VR-Lever pricing and advertising decision-making process is embedded in a balancing feedback loop process with a fixed goal, its historic market share.

VR-Lever always offers a slightly higher margin than VR-Cussons in order to obtain a slightly better share of the shelf space.

VR-Cussons management did not find any important differences between manufacturing resources and costs of both firms, once VR-Lever had managed to replicate the manufacturing technology of the new product launched by VR-Cussons. Therefore, the decision rules in the model are similar to the decisions used by VR-Cussons. VR-Lever follows a "cost plus" policy similar to VR-Cussons. However, the mark-up is adjusted as a function of the level of its long-term market share instead of market volume, as VR-Cussons did.

VR-Lever did not take any specific actions to develop the market. VR Dove users adopted the new product simply because they found it at a reasonable price compared to the bar soap and advertising influenced bar soap users to try it.

Resources and Managerial Decision-making Processes for Own-labels Their decision-making processes were different from VR-Cussons and VR-Lever for a number of reasons. First, Own-labels did not have a strategic intention to become leaders in this market because their participation in the market was for bargaining purposes with existing manufacturers. Second, Own-labels did not have specific manufacturing resources, so they bought the products from manufacturers specialized in private-labels products. Third, Own-labels managers did not promote their product through advertising. Thus, Own-labels only compete through pricing.

In the model, Own-labels decision-making process is related to the maximization of the income from display shelf. Own-labels pricing decisions are influenced by the evolution of their two sources of income: trade margin and products sales. The income received from branded products – trade margin – is compared to a historical income – 'Expected Margin' – to determine the trend in the income received from branded products. If the income from branded products falls as result of an explicit adjustment in trade margin, the decision rule simulating Own-labels managers will reduce the retail price. The retail price is reduced in order to expand the participation of own-label products in the market as a substitute for the income lost from manufacturers, as well as forcing an improvement in the trade margin obtained. However, as Own-labels expand their market share, the income from branded products will decline even more (if manufacturers of branded products do not offer higher trade margins), and Own-labels will further reduce their prices. The likely outcome of an unstable situation between manufacturers and retailers is that Own-labels will end up with most of the market through continuous price adjustments (as already occurred in the US – Wal-Mart – with some FMCG market segments). Thus, the pricing decisions related to

income from trade margin are two reinforcing feedback loops (loops R1 'Income from Branded Products' and R2 in figure 16).

On the other hand, if manufacturers offer higher trade margins or expand their market share aggressively, they may send Own-labels out of the market (only if Own-labels managerial decision making rules follow the reinforcing feedback process 'Income from branded products' mentioned in the previous paragraph). However, this situation will not occur because retailers' management will need to maintain a strong bargaining position to negotiate with the manufacturers of branded products.

Consequently, Own-labels managers set up a target for its market share, which is low enough to maintain bargaining power without pushing branded-products manufacturers out of the market. This decision-making process is embedded in a balancing feedback loop, named 'Bargaining Power' in figure 16, responsible for maintaining Own-labels participation in the market. In addition, Own-labels managers set a lower limit to price calculated by a simple 'cost plus' policy, which is determined by the sourcing cost of their products and the actual trade margin obtained from branded product manufacturers.

The main equations are:

Income from Trade Margin =
*(VR Cussons Trade Margin * VR Cussons Old Product Market Share) +*
*(VR Lever Old Product Trade Margin * VR Lever Market Share)* *(39)*

Effect of Trade Margin on Price = ƒ(Income from Trade Margin / Expected Trade Margin) *(40)*
where $f \leq 0$

$$\frac{dExpected\ Trade\ Margin}{dt} = \frac{Expected\ Trade\ Margin\ (t\text{-}1) + Income\ from\ Trade\ Margin\ (t)}{Time\ to\ adjust\ expectations} \quad (41)$$

$$\frac{dRetail\ Price}{dt} = \frac{Retail\ Price\ (t\text{-}1) + Price\ Adjustment\ (t)}{Time\ to\ adjust\ price} \quad (42)$$

Price Adjustment =
*(Effect of Trade Margin on Price + Effect of Market Performance on Price) * Retail Price * Price Adjustment Allowed* *(43)*

Effect of Market Performance on Price = ƒ(Actual Market Share / Market Share Goal) *(44)*
where $f \leq 0$

Price Adjustment Allowed = f(Actual Price / Minimum Price) (45)
where $0 \leq f \leq 1$

To sum up, Own-labels price is determined by two defensive processes: trade margin and bargaining power maintenance pricing decisions.

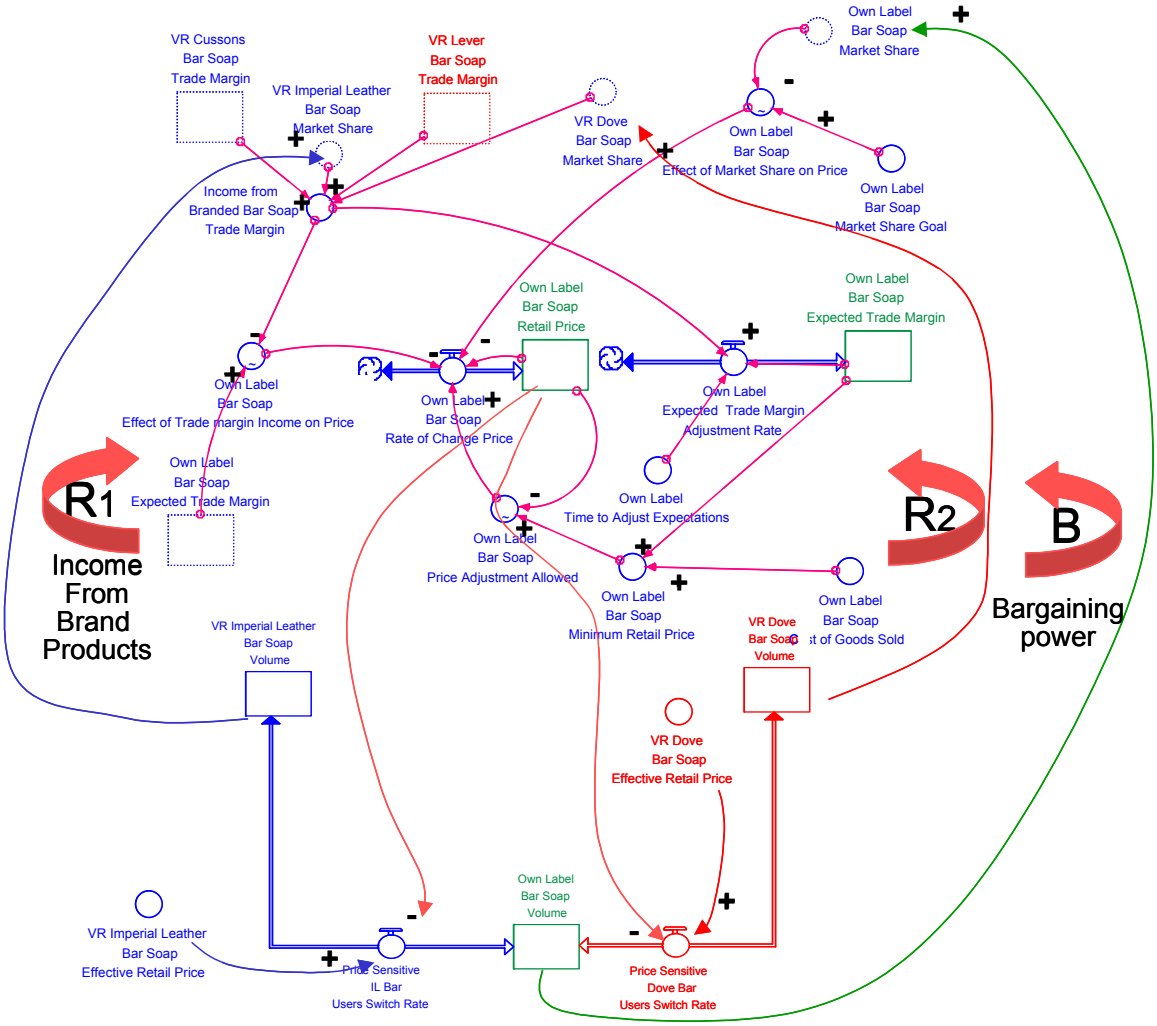

Figure 16. Own-label pricing: Managerial decision-making process

Real and Simulated Evolution of the Markets

The simulated evolution of the market presented here corresponds to the best fit with respect to the historical data available and the description of the decision-making processes obtained during the modeling project. However, the dynamics of the model partially diverged from the

original data because the model was specified as a 'transitional object' for facilitating dialogue among the management team. Consequently, we used goodness of fit to uncover flaws in the structure or parameters of the model, and assessed whether they were important relative to the purpose of the model (Sterman, 2000, Ch. 21). Therefore, the goodness-of-fit tests were used to explain specific pattern of behavior that the model was not able to replicate rather than to improve the historical fit of the model.

The Simulated Evolution of the New Product Market

Figure 17 shows the simulated and real evolution of the volume sold of liquid handwashing products for the branded products[d].

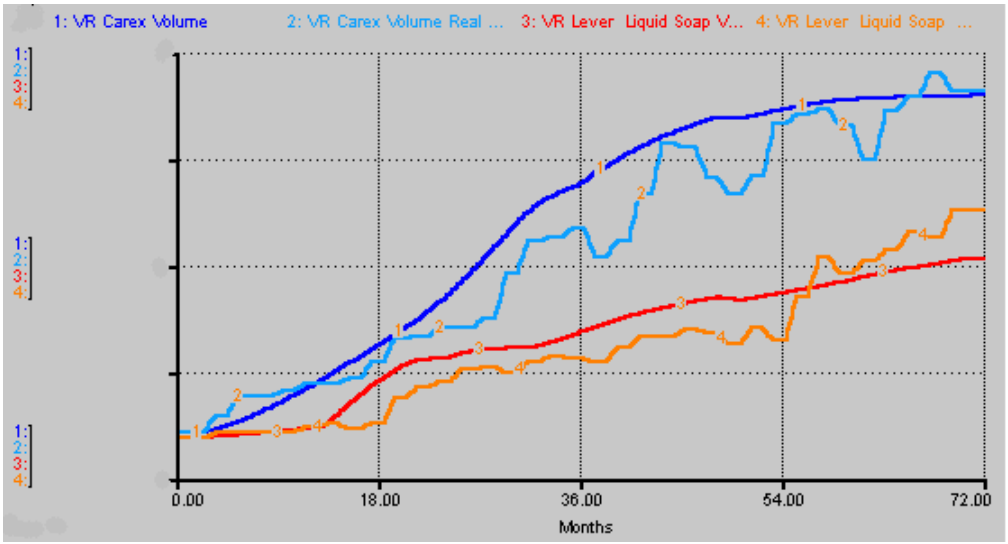

Figure 17. New product: Simulated and real volume evolution

VR-Cussons new product grew exceptionally fast during the first 36 months, as figure 17 shows, due to two managerial actions: marketing actions and price reduction, and the lack of competitors' competitive responses. One of the marketing actions was a trialing effort that reached an important proportion of the old product consumers – line 2 in figure 18 – and duplicated the flow generated only by the attractiveness of the product and price. The trialing effort was complemented with a strong reduction in the retail price of the product, as figure 19 shows, in order to erode one of the barriers to the expansion of the new market: the differential between old and new products prices, and achieve its expected market size faster. Once the trialing effort – line 2 in figure 18 – stopped due to the achievement of the expected initial market size, the increasing price parity between the old and new products augmented the proportion of old product customers moving to the new product, as line 1 in figure 18

[d] The coefficient of correlation between VR-Cussons' real and simulated volume is 0.92 and its goodness of fit is 0.95, for VR-Lever is 0.96 and 0.86; and for Own-labels is 0.87 and 0.95.

shows. However, three factors reduced the rate of growth – line 3 in figure 18. The first factor was the saturation of the liquid soap market – line 5 in figure 18 – whose size depended directly on the price ratio between new and old products. VR-Cussons management stopped reducing the price of the new product once they achieved its expected initial market size because they did not intend to erode their revenues. The second factor was the timing of advertising expenditure. The information obtained from the company indicated that relative advertising expenditure supporting the new product increased over time but only after the market had developed and not during the initial take off phase, as line 4 in figure 18 shows (line 4 represents a relative measure of the advertising expenditure between new and old products). The third factor was the reduction in the number of soap users which implied that the new-product market growth rate would declined over time, even though the simulated decisions raised the intensity of the marketing actions – line 3 in figure 18. Therefore the effectiveness of marketing actions to lure customers from bar soap tended to decline over time, so VR-Cussons ended up with a smaller market size than they would have obtained if the intensity of the marketing actions had been higher at the beginning of the process.

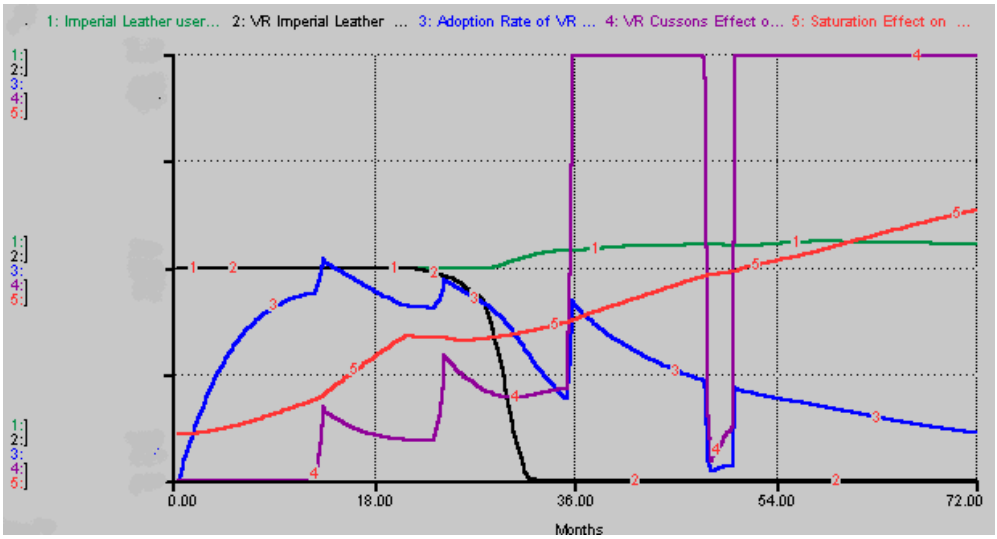

Figure 18. New product: Simulated effect of management actions influencing its development

Figure 19 presents the evolution of the real and simulated retail prices in the new product market for branded products[e]. While VR-Cussons had the initial decision to reduce its price – line 1 and 2 in figure 19 – in order to expand the new product market size, the simulated decision-making process of VR-Lever initially followed VR-Cussons price trajectory – line 3 in figure 19, as a reaction to the increasing erosion of its market share in the new product

[e] VR-Cussons's simulated price has a coefficient of correlation of 0.92 with real price and a goodness of fit of 0.74, VR-Lever has a coefficient of correlation of 1.02 and a goodness of fit of 0.34, and Own-Labels has a coefficient of correlation of 0.98 and a goodness of fit of 0.34.

market. Once its market share returned to its historical value, the simulated decision-making process increased its price again (VR-Lever decreased its real price after month 18, as figure 19 shows, instead). Thereafter, VR-Lever declined its price until it slightly undercut VR-Cussons' price to sustain its long-term market share in the new market. When VR-Lever reduced its prices, it started attracting users of VR-Dove soap bar into liquid soap, as well as reversing (from month 54) the flow of customers switching from VR-Lever to Liquid soap – line 1 in figure 20. In other words, the competitive advantage obtained by VR-Cussons during the first 36 months was matched by VR-Lever, and VR-Cussons finally faced a stronger competition from VR-Lever, as VR-Lever decision rules would sustain its historic market share.

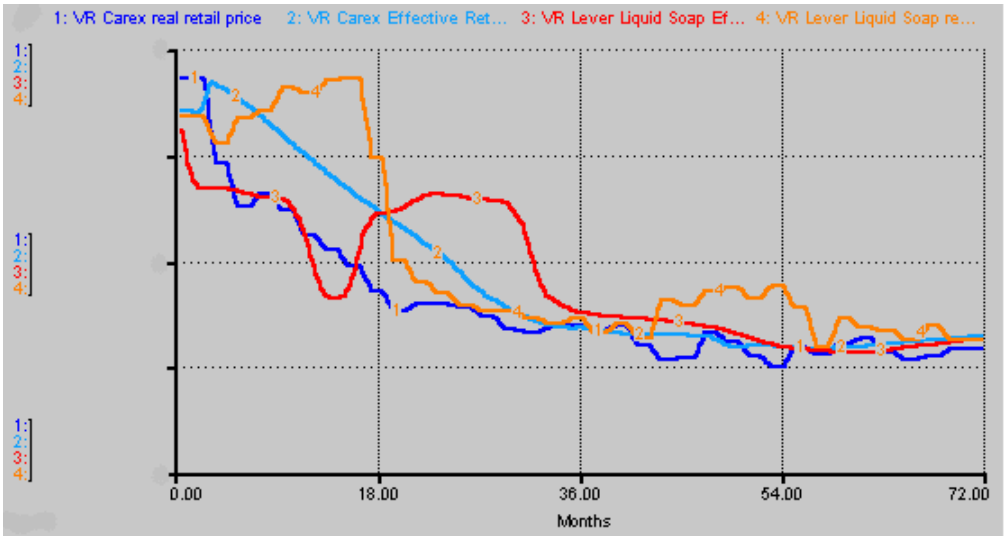

Figure 19. New product: Simulated price evolution

Once VR-Lever matched VR-Cussons, VR-Cussons had two options: one was to decrease the price even more in a downward spiraling process, or the second option was to increase advertising expenditure to maintain their market share. Since VR-Cussons had achieved its initial market target, they maintained the price stable. Thus, they increased the expenditure in advertising over time as line 3 in figure 20 shows (the expenditure on advertising is partially based on an exogenous time series). Therefore, VR-Cussons compensated the increasing flow of consumers moving to VR-Lever due to price – line 1 in figure 20 – by attracting some of them back using advertising as line 2 in figure 20 shows.

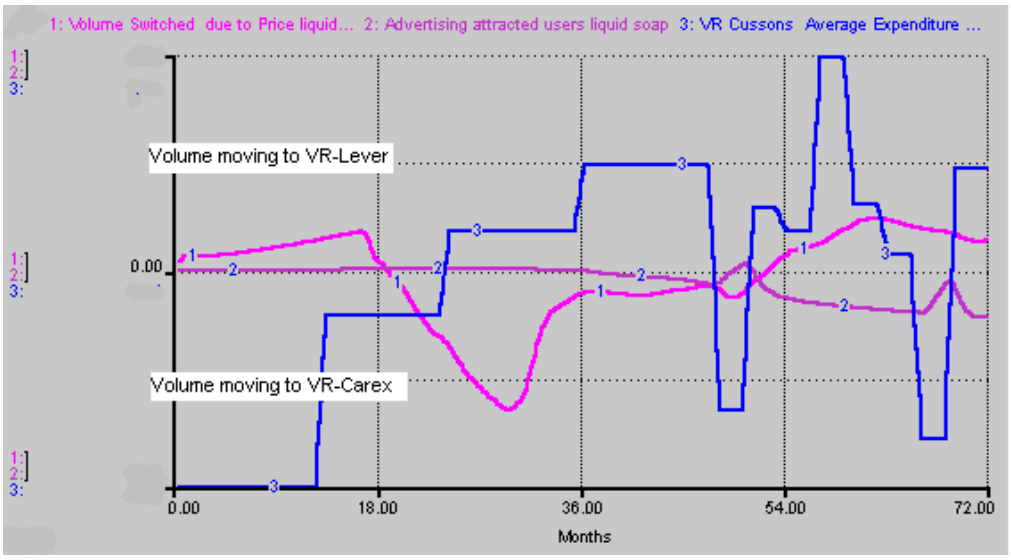

Figure 20. New product: Simulated volume switched between branded products

To conclude, VR-Cussons invested in trialing to build a huge market share in the new product segment as fast as possible, and supported its strategic intention in the market by reducing its price without substantially eroding its revenues. These two main actions helped VR-Cussons to achieve an important first-mover advantage in the first months of the new product market; however, VR-Lever quickly followed VR-Cussons' competitive actions decreasing its price to reverse the flow of customers between both firms. VR-Cussons progressively invested more money in advertising to sustain its market volume. VR-Cussons market growth became increasingly constrained not only by the actions of VR-Lever but also by a decreasing number of customers in the old product segment.

Own-labels had also started an aggressive reduction in their prices as line 1 – simulated volume – and line 2 – real time series – in figure 21 show. Even though Own-labels were obtaining more income from the trade margins of branded products as they grew – line 4 in figure 21 –, the decision-making process related to the maintenance of bargaining power – line 3 in figure 21 – reduced Own-labels' prices. Finally, prices stabilized as the share of their products increased (from month 40).

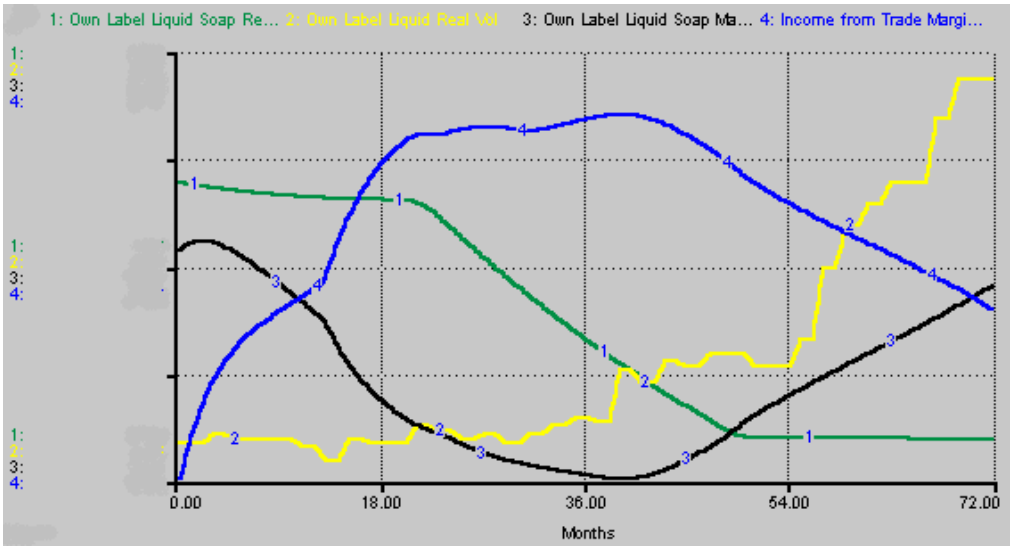

Figure 21. New product: Own-label simulated price evolution

Thus, the new product segment ended up with two situations:

- An equilibrium price between VR-Cussons and VR-Lever was established once both of them had achieved their long-term market goals. Own-labels also achieved an equilibrium price once they could maintain its bargaining power (represented here as a market share goal). Only at these equilibrium prices, the volume of customers for each competitor became relatively stable over time reinforcing the price level attained by the firms.
- VR-Cussons volume in the new product segment reached a plateau due to two factors. The first factor was the equilibrium price that reduced the attractiveness of the new product to more price sensitive old product users. The second factor was that VR-Lever could stop the draining process of its customers towards VR-Cussons when it matched VR-Cussons price. While Own-labels volume had started growing strongly at the end of the period influenced by the price differential with the branded products, Own-labels market size would reach a plateau, in a similar way to the old product market, once the branded products adjusted their prices to reduce the gap between prices.

The Simulated Evolution of the Bar Soap Market

Figure 22 presents the real and simulated evolution of the volume of branded bar soap since the launch of the liquid soap[f]. Figure 22 shows the declining trend in the volume of VR-

[f] VR-Cussons' volume correlation coefficient is 1.0 and its goodness of fit is 0.95; VR-Lever is 1.08 and 0.86; and Own-labels is 1.19 and -0.31, respectively. The negative value for Own-labels goodness of fit indicates that the simulated volume followed a trend opposite to the real volume time series. The reason for this situation is that VR-Cussons and VR-Lever prices declined for a longer period than in the real time series which depressed the recovery of Own-labels volume longer than in the real time series.

Cussons and VR-Lever. VR-Cussons and VR-Lever had almost the same volume in the market before Liquid soap, as figure 22 shows. After launching the new product, VR-Imperial Leather – line 1 – and VR-Lever's – line 3 – simulated volumes declined faster influenced by three processes: one was a continuous substitution of bar soaps for shower gels, the second process was the movement of users of bar to liquid soap, and the declining price of Own-labels products.

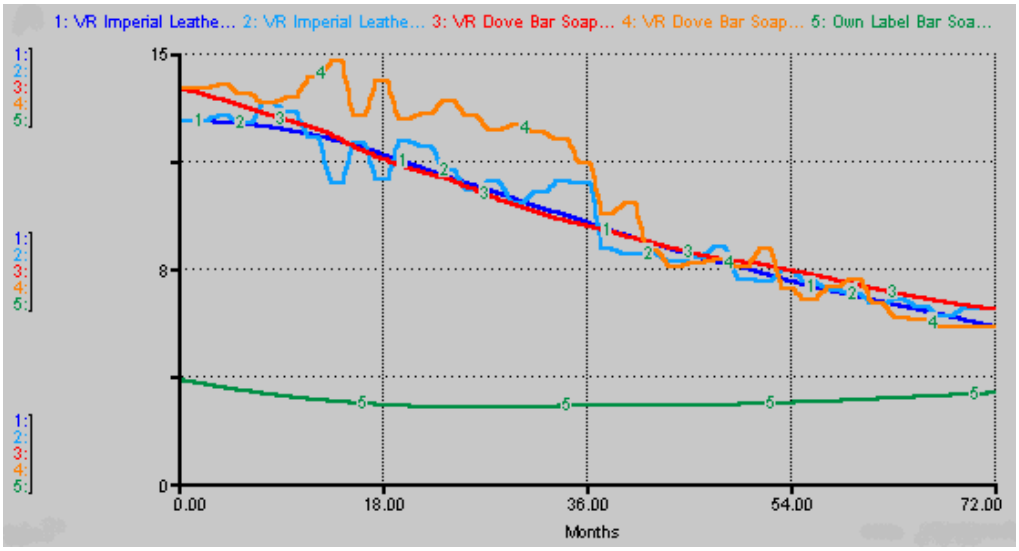

Figure 22. Bar Soap product: Real and simulated volume evolution

In the simulations, the declining volume influenced the pricing behavior of VR-Cussons and VR-Lever during the first 36 months, as figure 23 shows. VR-Cussons and VR-Lever reacted to declining volumes by reducing their prices, which generated some volume movement from Own-label to both firms. Then, both firms started increasing their prices after month 36 when the costs of goods sold rose because they lost part of their economies of scale, as their volume fell 50% since the beginning of the process, and reduced price discounts due to their floating-goal structure embedded in their pricing decision rule. An interesting observation is that both firms followed a very similar pricing trajectory even though they did not use each other price as a benchmark, and they only tried to achieve their internal goals.

Even though Own-labels had strongly reduced their prices, as figure 23 shows, Own-labels volume also declined for a long period, as line 5 in figure 22 shows, because VR-Cussons and VR-Lever had also been declining their prices[g]. Only when the branded products started

[g] VR-Cussons' simulated price has a coefficient of correlation of 1.00 with the real price and the goodness of fit is 0.14, VR-Lever has a coefficient of correlation of 1.01 and a goodness of fit is 0.12, and Own-labels has 1.03 and 0.54.

increasing their prices, Own-labels volume started increasing and recovering their market share. Once Own-label stabilized its market share, their prices stopped declining.

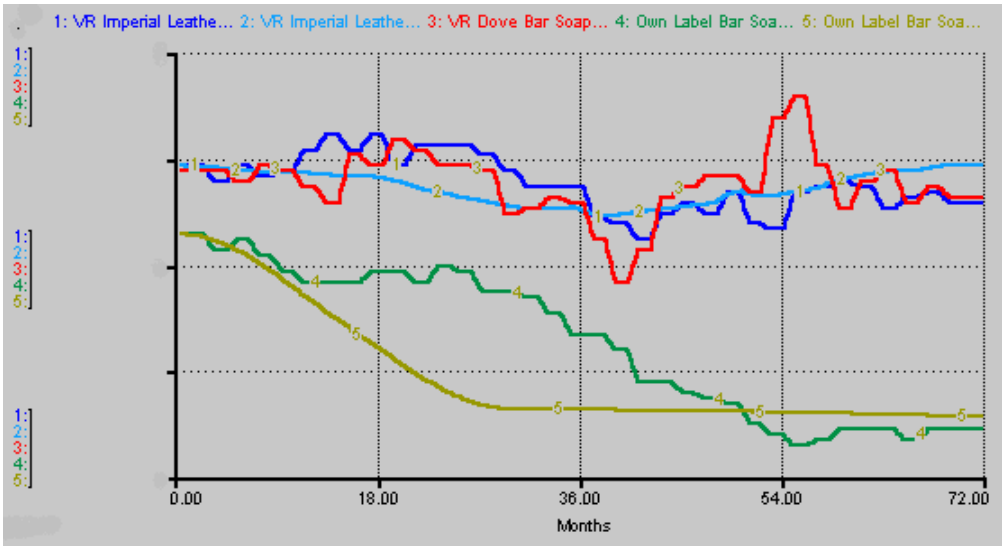

Figure 23. Bar Soap: Simulated and real price evolution

DISCUSSION OF THE RESULTS OF THE MODELLING PROJECT

The success of the model in replicating the evolution of the key variables in the industry was very important for the management team as they could visualize the impact of past policies and decision-making processes in the market. However, the main lesson for them was to understand the competitive dynamics of the industry and interrelationships existing between firms and their competitive actions. As a summary of the competitive dynamics , the following section presents an aggregated view of the dynamics of the market segment of the FMCG analyzed in this modeling project.

An Aggregated View of the Competitive Dynamics in the Fast-moving Consumer Goods Industry

It is widely known that managers in the FMCG industry compete fiercely for sustaining their market participation. The graphical representation of the system of resources presented in figure 24 provides an overview of the reasons for this behavior. The dynamics of the industry plays out in the following way. The size of the customer base drives manufacturing capacity. Since manufacturing capacity determines the level of cost of goods sold, its expansion defines the level of the economies of scale achieved and the reduction in the level of cost of goods sold. Lower costs imply the ability to determine low prices. Low prices increase the value for money of the product attracting more customers. The dynamics of this part of the system

of resource reinforces its success leading to even better performance and the demise of competitors (R1). The only way to reduce the reinforcing process that a leader may achieve is reducing the attractiveness of their products immediately by launching similar products or reducing prices, as it had occurred.

An additional effect is the bargaining power with respect to the retailers. Retailers have another key resource that is able to hamper the reinforcing process of the market leader: display shelf. Display shelf is another hardly contested resource in the FMCG industry. Display shelf is a major influence in the effectiveness of price promotions and advertising. Companies in the FMCG industry use the trade margin as a tool of negotiation with retailers, but trade margin affects retail prices (except the company is prepared to reduce its gross margin for compensating higher trade margins). An initial analysis of the dynamics between the size of the customers' base and share of display shelf may indicate that these two resources are also embedded in a reinforcing process (more customers implies more share of display shelf because it will represent higher income for the retailer) − R2. However, additional factors reduce the strength of the relationship between these resources, such as the bargaining power of the retailer. In that sense, private label products are established in the market by retailers to control the strength of these two reinforcing process, as B1 – Bargaining power maintenance – feedback loop shows in figure 24.

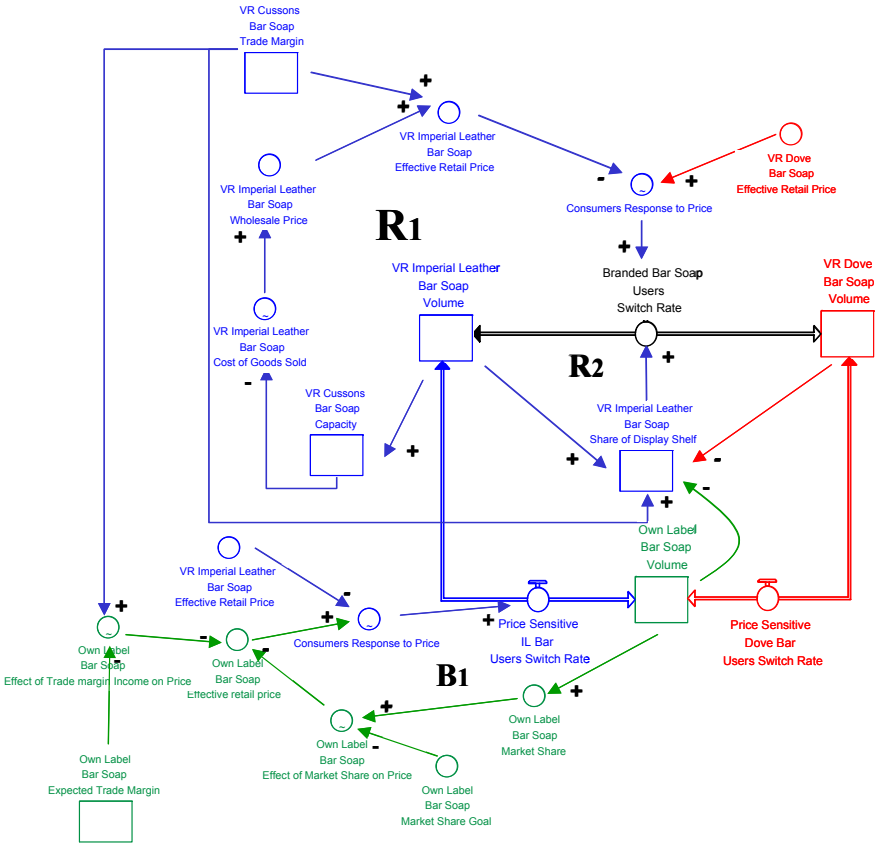

Figure 24. The perceived system of strategic resources in the FMCG industry

SUMMARY AND CONCLUSIONS

The modeling project was very useful for the management team as they were able to understand the effects of their actions in the profitability and the evolution of the market. The model was also used for understanding the dynamics of similar markets in Germany and France.

The contributions of the case study for System Dynamics practitioners are related to the category of behavioral models. Behavioral models in the tradition of system dynamics represent firms as they are perceived by their management teams (Morecroft, Lane, and Viita, 1991). This modeling process based on the management knowledge about the industry captures not only the different strategic rationale and decision-making processes existing among competing management teams but also the operating constraints generated by those resources perceived strategically important.

The case study showed the existence of different strategic rationale existing in the market. The focal company in the case study had been strongly attached to their old product for many years (the product that made them leaders in this industry). This attachment was strengthened by major investments in brand building, research and manufacturing facilities as well as in managerial capabilities for understanding and operating in this segment. Its main competitor, a complete newcomer to the industry, acquired its competitive strengths buying existing firms in the industry, with the clear intention of building a vast customer base to exploit the economies of scale and bargaining power that firms need to possess in the fast-moving consumer goods industry if they want to become market leaders. Finally, the multiple grocers and retailers had a completely different resource to control: display shelf (the main source of their income). The trade-channel managerial decision-making process was characterized as being interested in maximizing the income obtained from the display shelf.

Both the real and the simulated time series revealed that competing firms could reach equilibrium prices in fiercely competitive industries. This situation occurred due to the goal setting process existing in the firms' decision rules. When there are floating goals embedded in decisions rules, decision rules generate 'compliance' with situations that remain similar for a period long enough to be accepted as fact. VR-Cussons pricing decision rule is based on the continuous short-term comparison between past and actual volume and the magnitude

response function, which determines the strength of marketing actions, does not reduce price when the volume differences become small (see figure 17). This process is also known as 'boiled frog' effect (Senge, 1999). This effect occurs when people do not perceive small changes over time as important, which may become very important when they are observed over a long time span. VR-Lever pricing decision rule compares the actual market share with respect to a fixed market share goal. While the goal is fixed, this structure also generates a floating goal effect because market share is a relative measure of performance that does not depend on the evolution of the market volume. In this case, VR-Lever decision rule inferred that VR-Lever was maintaining the same market share over time in the declining bar soap market because all participants' volumes decline at a similar rate (and their shares remain stable). Consequently, the decision rule inferred that there was no need to decrease prices.

An additional observation is the existence of more volatility in price time series than in volume time series. These interesting results indicate the existence of long-term adjustments in consumer habits, which are reflected in volumes, and short-term reactions of managers to the non-attainment of their market share goals, which are reflected in prices. Managers' behavior may have two explanations: one is that managers misperceived the feedback effect between their pricing decisions and the consumers' responses, as Sterman (1989) suggested, or a second explanation is that managers were aware of the reinforcing process generated by increasing market shares, as figure 24 shows, and they preferred stopping any competitor growing sooner than later.

The case study also illustrated two important implications for system dynamics models of industries and firms. First, the dynamics of industries cannot always be deduced by modeling an aggregation of individual firms and assuming these firms share a common feedback structure. Second, dysfunctional behavior of individual firms does not always arise from flawed internal feedback structure but may also stem from competitive interactions among rival firms. The field of system dynamics has paid relatively little attention to interactions between competing firms when analyzing the dynamics of business performance. Instead researchers and practitioners have tended to develop individual-firm models or aggregate industry models. However, competitive interactions can shape the destiny of industries as well as the performance of individual firms

Building on these results and a perceived gap in the system dynamics literature, I propose a modeling framework for examining the performance of rival firms in competitive industries. In this framework an industry is represented as two or more *distinctive* individual firms, each advocating a different view of strategically important resources and each pursuing somewhat

different resource-building policies, strongly interconnected through their shared environment and shared customers. Firm performance no longer arises solely from the internal policy interactions of individual firms, as has traditionally been suggested in system dynamics literature, but also from interactions among the rival firms and their heterogeneous decision-makers, as they attempt to configure a unique system of resources in order to achieve a sustainable competitive advantage.

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