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EMERGING APPROACHES TO RETAIL OUTLET MANAGEMENT

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WP 882-76 November 1976

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Abstract

Major problems faced by the multi-outlet retailer include those of strategic planning, tactical decisions and operational control. The strategic planning questions include: How many outlets should be built in the next Y years? In what cities should they be built? When? Tactical decisions concern the selection of a particular site: What is the potential of a particular site? What are the characteristics that lead to the success of a particular site? What will be the impact of an outlet on neighboring outlets? Operational control procedures include exception reporting, detection of new trends, planning and monitoring of advertising and promotional expenditures.

This paper reviews emerging quantitative approaches to retail outlet management and shows how a few key concepts can be and have been used in a variety of product areas.

Introduction:

In many industries, products are offered to consumers through company controlled retail outlets. Some examples are supermarket chains, gasoline, banks, and fast foods, where the outlets are supermarkets, service stations, branch banks and franchised restaurants respectively. As in other industries, the problems of retail outlet management can be classified into three groups -- strategic planning, tactical decisions and operational control.

The strategic planning questions are:

- How many outlets should be built in the next Y years?
- In what cities (markets) should they be built?
- When?

The tactical decisions concern the selection of specific sites -- i.e.

- What is the potential of a specific site?
- What is the impact of changes in the environment on site potential, e.g. construction of a motel on gas station sales?
- What is the impact of an outlet on a neighboring outlet?

Operational control procedures include

- exception reporting
- detection of new trends
- planning and monitoring of advertising and promotional expenditures.

In the past much of the quantitative work has focused on tactical problems, particularly on site evaluation (see Green and Appelbaum [5] for a brief review). Strategic issues have largely been handled in an informal way. Recently, some researchers have recognized that site potential is related to the

product or company "image" (see Stanley and Sewall [17] but they do not indicate how image can be changed in a way that increases potential.

The purpose of this paper is to describe some emerging quantitative approaches to retail outlet management, and to show how a few key concepts can be and have been successfully used in a variety of product areas. The paper does not exhaustively review the literature in retail outlet management, but rather, highlights the important ideas that underlie problems in this area.

1.0 Strategic Planning

Conventional market share analysis suggests that, after a building plan is implemented, market share will equal outlet share. If this were the case, the planning decision rules would be simple: build where the next unit of outlet (equal to market) share brings the highest profit (perhaps in Net Present Value terms), continue building until either budget is exhausted, or additional share does not produce acceptable returns.

Life is rarely this simple as several authors have pointed out (see Kotler [10], pp. 786-788). Several reasons have been suggested for why market share does not seem to increase linearly with outlet share, including inequalities in promotional and outlet-quality effectiveness among companies, some vague economies-of-scale argument, etc., but a simple explanation for this behavior is still the subject of debate (see Lilien [12] for one analysis). The important observation, however, is that a <u>non</u>linear, generally S-shaped relationship exists between outlet share and market share, making the question of how many outlets to build, and in what markets, considerably more complex (Figure 1 illustrates this relationship).

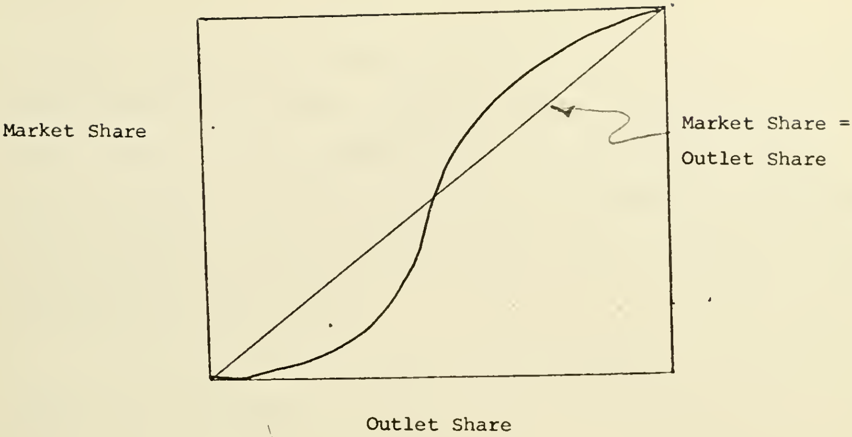


FIGURE 1

The Market Share-Outlet Share Relationship

A procedure has been developed and implemented to help management make both these decisions. It can help make better decisions even if those decisions are not always "optimal" (in the narrow, mathematical sense). And these "vaguely-right" (Davidson [3]) answers are, in fact, accurate enough for a practical, planning situation.

The implications of the S-shaped relationship are important. From the point of view of maximizing incremental market share, a firm would only build in markets where the firm already had an established position. A major oil company took explicit account of this relationship in its entry strategy into a new state during the late sixties. A decision was made not to enter unless outlet share could be immediately built up to a reasonable (5%-6%) level; i.e., where marginal market share returns for adding additional stations were reasonable. Several local distributors were acquired and an instant 5% outlet share was developed on which a

building program was then based. Building up from scratch was recognized as an unprofitable strategy. Thus when a company expands geographically, the strategy should be to build up share quickly in each new market before proceeding to the next. Simultaneous expansion into a large number of new markets is likely to be unsuccessful, unless financial and managerial constraints are non-existent.

Even after understanding this market share-outlet share relationship, however, the development of plans are not straightforward.

1.1 Using the S-Curve as Part of a Planning System

Suppose that a firm has empirically developed an S-curve for its markets and now wants to know how many outlets to build in each of a large number of markets during a several (say, five) year planning period. Generally the first year results become budget items -- building funds are allocated in accordance with plan "year 1". The following year results are used to prepare profit plan projections and to help allocate outlet-site procurement funds (in anticipation of building).

Observe the nature of the managerial decision process: all planned outlets may not always be built due to changing local building codes, construction difficulties, lack of sites, etc. If an extra, "choice" site becomes available in a desirable area, an outlet may be constructed on it immediately, even if no money was originally allocated. What management needs to know is whether to build five outlets or twenty outlets in a given area. The different between (say) five and six outlets is unimportant as it often washes out during implementation.

Before looking for a good, or "best" plan, let us examine how to determine the value of a particular, known, plan. XYZ Company's plan for market A may be to build three outlets this year and two in each of the rest of the years of the planning horizon. Let us assume that the firm has a forecast of competitive activity (building plans for all firms other than XYZ) as well as market volume and volume growth rate, current and forecast prices and margins, cost of land, etc. Thus XYZ has available all the information needed to make an objective financial evaluation of this situation as follows:

<u>Step 1</u>: For each year of the planning period calculate XYZ's plans and industry plans.

<u>Step 2</u>: Use the S-curve relationship to find the outlet share and thus the associated market share (MS_t) for each year t.

<u>Step 3</u>: Multiply MS_t by the projected volume in the market to get XYZ's volume, (Vol_t).

<u>Step 4</u>: Multiply Vol_t by the projected gross margin (Mar_t) to get Gross Revenue ($GRev_t$).

<u>Step 5:</u> Adjust Gross Revenue by investment, debit factors to get a cash flow associated with each year: CF_t.

<u>Final Step</u>: Determine the net present value (NPV) associated with the plan as:

$$NPV = \sum_{t=1}^{T} \frac{CF_t}{(1-R)^{t-1}}$$

where T is the planning horizon and R is the discount rate.

Now, if every outlet, (in NPV terms) were worth less than the one built before it, the best building plan would be the one which first built

the outlet with the highest current incremental NPV, then the one with the next highest, etc. But as the S-curve indicates, there are often increasing returns in a building plan which must be considered. The procedure developed takes this region of increasing returns into consideration. It is perhaps best explained by an example.

Using the procedure on the preceeding page, we can calculate the NPV associated with any building plan. Suppose XYZ has two markets to consider, Market A and Market B, and has calculated the NPV associated with each building plan in each market. Figure 2 displays the results:

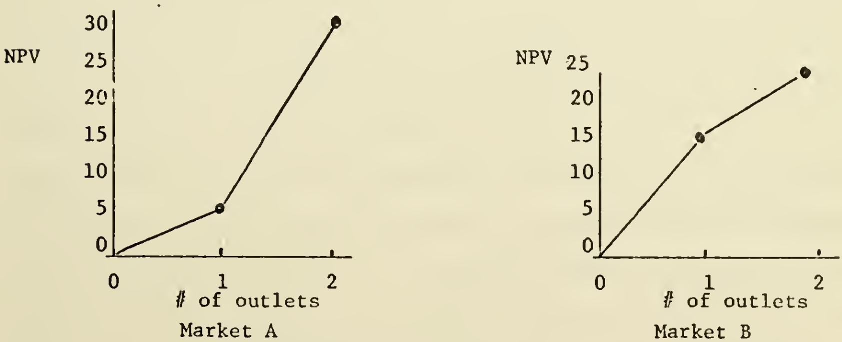


Figure 2: Allocation Example

Suppose XYZ only wants to build one outlet in total -- clearly that outlet should be built in Market B. If two outlets are to be built, they should both be built in A. If three are to be built, two should be built in A, one in B, etc. These results are summarized in Table 1.

Total Building Constraint	PLAN A	PLAN B	TOTAL NPV
1	0	1	15
2	2	0	30
3	2	1	45
4	2	2	55

TABLE 1: Example: Allocation Procedure Results

Note that here, if an incremental analysis were used (for Total Building Constraint = 2) outlet number 2 would be built in Market B. This would yield a total NPV of 25 instead of the best case, 30.

The procedure above looks not only at the value of single outlets but of groups of outlets to assess their profitability. The actual mechanics of the procedure, especially with building plans over time, are somewhat technical and are treated elsewhere (see Lilien and Rao [11]). The important point is that in practice the procedure has proved efficient, and easy to use, producing results that are optimal or close to optimal. The procedure was run on a 170-market, five-year planning problem considering 3,000 outlets. The allocation procedure took less than a minute on an IBM 360-75; including input-output and NPV calculations the entire procedure ran in well under five minutes. This efficiency is important for allowing update runs and sensitivity analyses at low cost.

This system has been used as an aid in outlet building planning at a major U.S. Corporation since 1969. The procedure was used in the following way:

(1) To generate allocation plans, given a set of assumptions and inputs;

(2) To test the allocation against changes in those assumptions.

Step 2 is critical in implementation and use. Suppose the model-allocation doesn't change with projected possible variation in land costs but is very sensitive to variations in profit margin projections. Then have your analysts spend most or all of their time firming up the margin projection and forget about the land cost figures.

(3) To aid in determining the overall building allocation.

Outlets are an investment and firms have alternative uses for their building capital. Then as many outlets should be built as still return a positive NPV when discounted at the firm's cut-off or internal rate of return. Thus, no overall building constraint is needed -- rather, the procedure should shut off when the incremental NPV for the last outlet planned becomes zero or negative. The discount factor is another important impact on the over-all building level as well as the allocation.

The model did not replace or transcend the manager; rather it helped provide more meaningful inputs and thus more useful outputs. The managers are involved at each step of shaping the final results and by being able to control the process they grow to trust it. Managers learn a great deal about their own decision situation and how it interacts with the firm's problems. They become more secure in their own judgments as well.

To summarize, the key idea here is that development of efficient building plans requires explicit recognition of the S-curve relationship, i.e. the impact of the new building upon the entire structure of the market. Use of this relationship leads to significant improvements in retail outlet building policies.

2.0 Site Selection and Site Potential

A second key problem faced by the multi-outlet retailer is, given the decision to locate in a market area or city, where the outlet should be placed. Approaches vary. Applebaum [2] reports that 10% of a sample of 170 large retail chains did no systematic analysis for location of retail outlets. That same study had research expenditures varying widely, with the average research per new location being about 1% of the site-investment cost.

When Eastern Shopping Centers appraises a site, that location is"subjected to a searching analysis covering current populations ... population trends, current and per capita income of the area, competing centers or retailers, ... road patterns," etc. In contrast, a drug chain appraises a site "just by taking a ride around a particular area, talking to some of the people living there and getting a feel for the site's expansion capabilities." (Duncan and Phillips [4]).

What seems called for is a structure for analyzing outlet site potential. A variety of different models have been suggested to aid in the evaluation and measurement of this potential, several of which are reviewed below.

These models share a common underlying structure, modified or customized for the particular business or purchase situation. This structure can be summarized as

(1) $$\text{Site Potential} = \text{Local Sales Component} + \text{Transient Sales Component}$$

Relationship (1) says that the sales potential at a particular site has two separate components: those sales derived from people who live

nearby and those sales from people who are driving through, but who do not live in the area. The nature and importance of these two components vary considerably from product class to product class, but the basic structure serves as a starting point for model development.

The transient component of sales is of great importance in product classes such as gasoline and fast foods where a great deal of brand-to-brand substitution is possible and where the purchase trip is often a secondary part of another journey. We review models used in several different product areas below.

2.1 Case 1: Gas Station Models

Reinitz [16] describes a model developed to estimate site potential for gasoline. (The authors participated in several stages of the development of this model). In this model, the structure of which is appropriate for the fast food business as well,

$$\text{Site potential} = f_1 + f_2$$

where f_1 = local area potential and

f_2 = transient sales potential

The procedure used to estimate f_1 and f_2 is as follows:

i) Choose a local area radius, usually 1 mile. (Model results are generally not sensitive to the size of this radius as long as it is not too small). Obtain the car population, gasoline usage and other information descriptiveof the area.

ii) Obtain a census of, and ratings of, existing outlets along a number of predetermined attributes: Let

r_{ij} = rating of outlet i, in the trading area along attribute j. j may be ease of accessability, e.g.

iii) Obtain importance weights of these attributes from consumers

w_j = average importance weight of attrubute j.

One key attribute to include is brand-image or market presence, linking this model with the S-curve model in the previous section.

iv) Now estimate

$$f_1 = \frac{\sum_{\text{new outlet}} w_i r_{ij}}{\sum_{\substack{\text{all outlets} \\ \text{in trading} \\ \text{area}}} w_i r_{ij}} \times \text{Area Gasoline Potential} \times \text{Fraction of Sales bought locally.} \quad (2)$$

The other component, f_2, is calculated similarly, with a "road-leg" replacing the local trading area, and traffic count data replacing "Area Gasoline Potential".

The development for fast foods is essentially equivalent, with consumption habit data replacing gasoline usage. Functional forms other than (2) have been used as well, with no significant improvement in predictive power.

2.2 Case 2: Supermarket Site Potential

Much has been written on the art and science of supermarket site potential. Green and Applebaum [5] review the relevant literature. We highlight here some important model-developments.

Applebaum [1] describes a procedure called an "analogue" approach, based on the assumption that the drawing power of a site will be close to that of other stores of the chain under similar conditions. A major diffculty is the identification of "similar" conditions.

Huff ([8] and [9]) eliminates this problem by using the following model:

$$P_{ij} = \frac{S_j^{\lambda_s} T_{ij}^{\lambda_t}}{\sum_{k=1}^{n} S_k^{\lambda_s} T_{ik}^{\lambda_t}}$$

where P_{ij} = Probability of a customer in area i shopping at retail location j

S_j = Square feet of retail selling area of location j

T_{ij} = Driving time from area i to retail location j

λ_s, λ_t = Parameters associated with selling area and driving time respectively.

This model postulates that patronage is positively related to the size (and, hence, merchandise assortment) of the outlet and inversely related to the distance from the store to home. Huff shows that λ_t varies with merchandise being sought, and, hence "reasonable" search effort.

Stanley and Sewell [17] modify the Huff model by replacing "size" with an image variable, developed as the distance from the chain position to an "ideal" chain position using multi-dimensional scaling. They report significant improvements in the predictive ability of the model.

The Stanley and Sewall procedure seems to be an important improvement but does not suggest how to improve image.

Returning to the S-curve idea, it appears that "image" might well be related to outlet share in a nonlinear way. Further work in this area would clearly be helpful in making this concept operational. In addition, a transient component could clearly be introduced to estimate potential of a site in a shopping mall. In this case, the transient component could be related to the volume of foot traffic attracted to the mall for purposes other than grocery shopping. Again, further work seems justified.

2.3 Case 3: Automobile Dealerships

Hlavac and Little [6] describe a procedure for estimating site potential for automobile dealerships. The structure of the model is as follows: Hlavac and Little assume that consumer selection of a dealer is related to dealer location and customer preference for a particular auto-make, and is relative to the attraction of all other dealers.

Consider one particular dealer, and split the region into a set of areas, i = 1, ... I. Then define

g_i = pull of the dealer on a buyer in geographic segment or area i;

h_i = intrinsic pull of a dealer, independent of make (related primarily to ease of accessability);

q_i = make preference for the brand for buyers in segment i.

Then the pull of the dealer for buyers in geographic segment i is defined as

$$g_i = h_i * q_i$$

and letting p_i = the purchase probability for a buyer in area i then

$$p_i = \frac{g_{io}}{\sum_j g_{ij}} \qquad \text{(where j refers to the dealer, o to the dealer of interest)}$$

$$= \frac{\text{Pull of dealer x make preference}}{\sum_{\substack{\text{all}\\ \text{dealers}}} \text{Pull of dealer x make preference}}$$

The authors postulate an exponential drop off in dealer pull with distance and equate make preference with brand share. A procedure is developed to estimate the parameters of the dealer pull function and the model is shown to fit data quite well.

This model, similar in spirit to the supermarket models, suggests a brand-size effect, included in the model as make-preference. And the approach seems fruitful as the model fits data well. A limitation seems to be the use of distance from dealership as a surrogate for convenience. And, again, a S-curve effect might be incorporated with some benefit.

2.4 Case 4: Retail Banking

The authors have used a model similar to those above, for retail bank outlet potential, where site-potential is modeled as

$$\text{Site potential} = \frac{\text{Site Draw}}{\sum \text{Competing local site draws}}$$

Two phenomena are of interest here. The first is that a market share-outlet share, S-type relationship exists in this market if we define market share as share of new business.

The second phenomena is that site sales grow to long run potential faster in areas with high property turnover. We see a relationship such as that illustrated in Figure 3. Here area A has higher turnover and an outlet there grows to its long term potential faster than one built in area B. Similarly, account turnover in area A will continue to be higher than turnover in B throughout the life of the outlet. Management must then balance the benefits of faster growth to potential with the continuing costs of long-term account turnover in making site selection decisions for retail banks.

It is interesting to note the trend among local area retail banks toward merger and adoption of a common name. Originally adopted for data-processing economies, this move has resulted in additional benefits through S-curve type share effects.

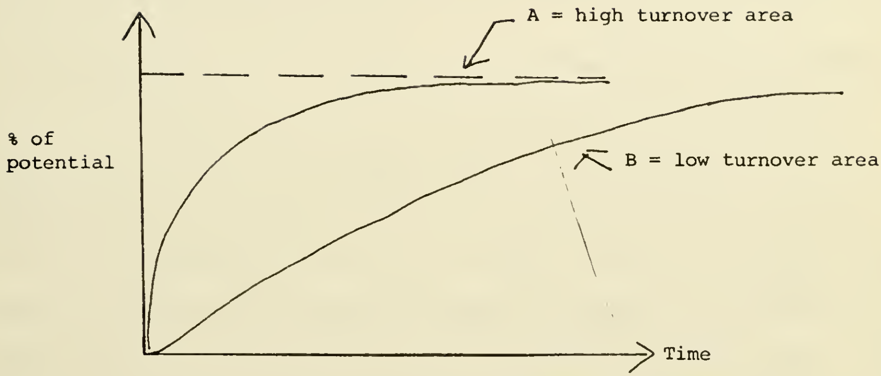


FIGURE 3:

Branch Bank Growth to Site Potential

There are many multi-outlet retailing industries not touched here including giant retailers, hotels, and specialty item chains but the results described are representative of the current state of knowledge and are indicative of what is being used. The main point of the review in this section is to suggest that structuring the site evaluation problem as Potential = local + transient sales seems well adapted to problems in the retail outlet industry, and should be exploited.

A key opportunity in this area is the integration of S-curve effects into site evaluation. The results from the previous section suggest the power of evaluating the total market impact of a building plan. That total impact will not be the sum of the effect of individual sites, by themselves, due to S-curve synergy. Thus, there is a major opportunity to improve these models by including this synergistic effect of current market position in evaluating building and divestment plans. Then a total market impact would be estimated and the effect on market profitability more accurately gauged.

3.0 Operational Control

Most multi-outlet retailers and, in fact, most commercial organizations have sales and profit reporting systems. These systems report on various measures of performance such as sales, cost, profits, etc. and compare what happened in the current period with past performance. Such a comparison implicitly assumes that this period should be like the last period or should show some amount of growth -- generally naive and uninformative assumptions.

To be meaningful and actionable, however, such comparisons must be made to what _should_ have happened. In order to say what should have happened a model is required, linking control procedures to specific, quantitative predictions of what performance should be or is expected to be like.

Modeling approaches to strategic planning and site location evaluation have been described in the previous sections of this paper. An operational control procedure can be built around these models. Consider a market area in which a site expansion plan has been implemented. Using the model, predictions of sales either in total or by product type in each period can be developed. These predictions necessarily use planned values for company activities and estimates of competitive activity in the market. The predictions can be displayed in tabular form (Figure 4) and in graphical form (Figure 5). The solid line in Figure 5 shows the historical sales in the market, the dotted line the model forecasts.

In addition to the predictions, an estimate of forecast error is also developed. This estimate can either be obtained directly from the model or observed from the performance of the model against actual sales in the past.

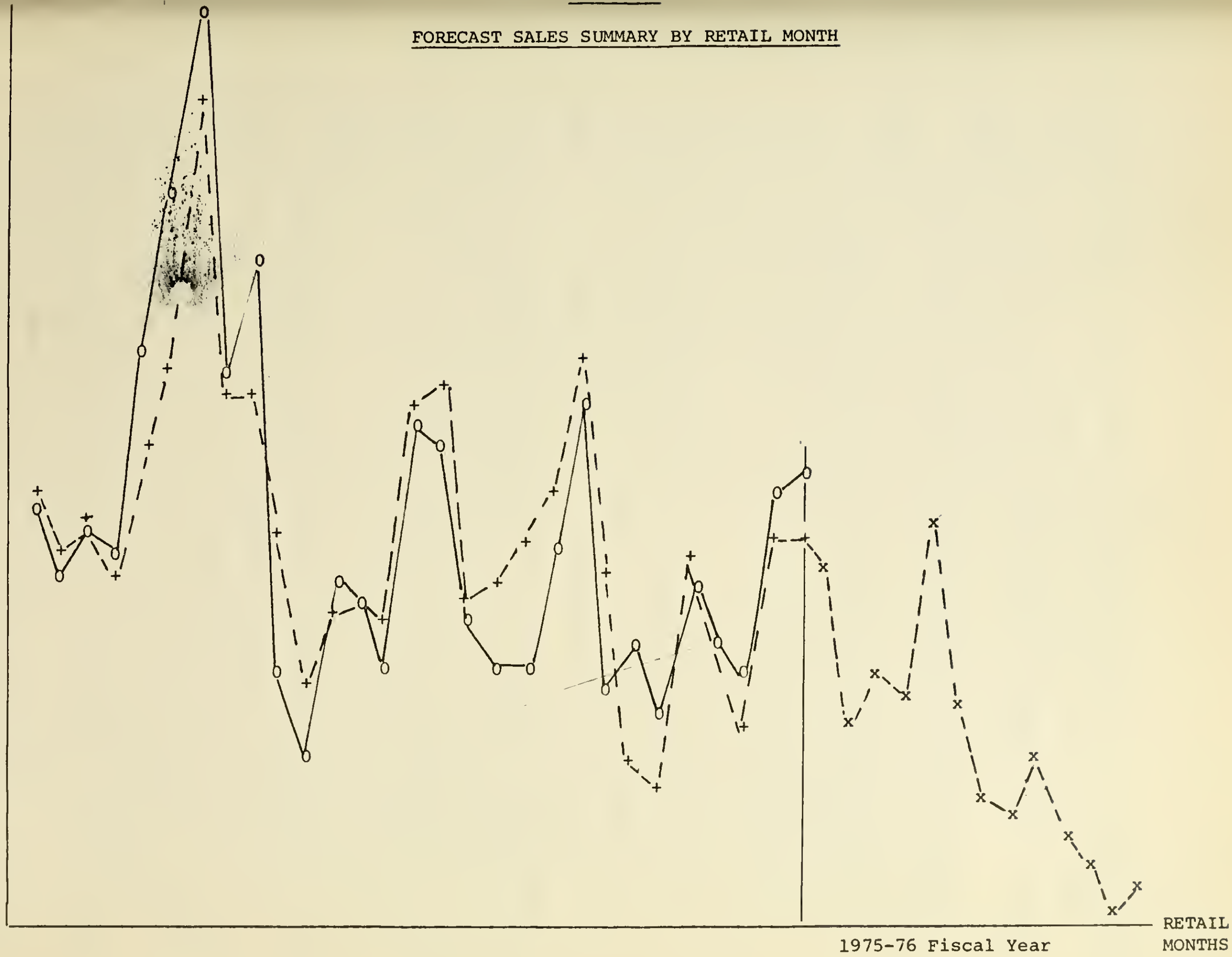
Now suppose a specific marketing plan is implemented. Actual sales for a period are reported, as are the actual values of company and competitive activities. Actual sales are compared to sales predicted by the model.

FIGURE 4

SAMPLE FORECAST SALES SUMMARY 1975-76 FISCAL YEAR

	1st quarter	2nd quarter	3rd quarter	4th quarter	1975-76 Forecast	1974-75 Actual	Model Fcst./ Previous Yr.
Base Sales	813.	791.	924.	656.	3183.	3444.	.924
Promo. Sales	167.	84.	206.	74.	532.	560.	.949
Total Sales	980.	875.	1130.	729.	3714.	4004.	.928

FORECAST SALES SUMMARY BY RETAIL MONTH



o - Market potential

+ - Fitted Values

x - Projection

If the difference between actual and predicted exceeds the previously determined forecast error-limit, an exception report is issued. This report triggers a "cause analysis" to determine why the exception occurred. (This is often referred to as a "marketing audit".)

There are several possible circumstances that could have led to an exception:

(a) company and competitive activities differed from assumptions used in the development of predictions. Management can investigate the reasons for such differences, and develop administrative procedures to ensure greater conformity to plans.

(b) a new type of activity (either company or competitive) not considered in the model structured occurred in the market. For example, a novel type of promotion may have been introduced. In such cases, the model needs to be enriched by including a factor representing the new activity.

(c) actual activities were in line with planned and estimated activities. In such cases the model itself might be at fault. It needs to be re-examined. In this case, the control procedure reports on itself and suggests that it be improved.

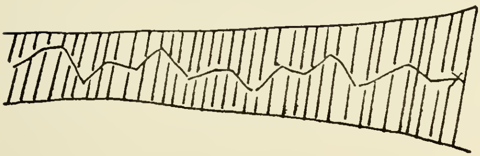
Figure 6 shows some important types of exceptions that can occur. The shaded area around the forecast indicates the range of variability to be expected. As forecasts of periods further away in time are made, this range increases. Exceptions 4, 5, and 6 in the figure are of particular interest. Exception 4 shows a situation where an increase in sales in one period . Unsuccessful promotions often present such sales profiles. Exceptions 5 and 6 are early indicators of developing trends.

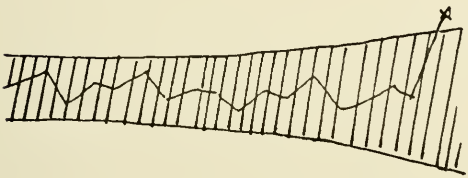
Figure 7 shows a convenient way to display the exception information, and relate period sales, and cumulative sales to date, to predictions.

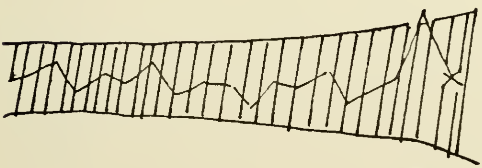
FIGURE 6

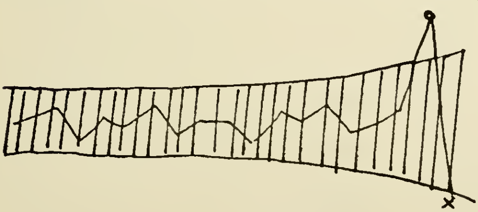
UPDATE STATUS -- TREND ANALYSIS

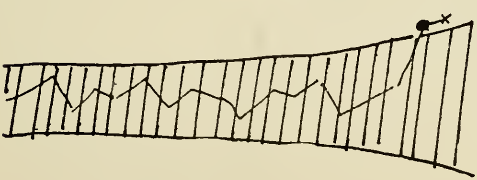
DATA BEHAVIOR: | STATUS REPORT

1.  IN CONTROL

2.  UPDATE EXCEPTION

3.  LAST POINT EXCEPTION, RETURN TO NORMAL TREND

4.  UPDATE AND LAST POINT BOTH EXCEPTIONS

5.  UPDATE AND LAST POINT BOTH EXCEPTIONS, POSSIBLE NEW TREND

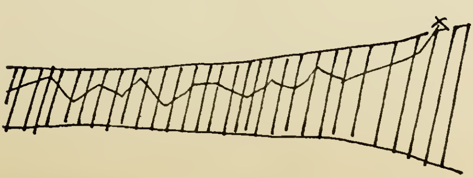
6.  CUMULATIVE EXCEPTION NEW TREND

FIGURE 7

SUMMARY EXCEPTION REPORT

JANUARY-MAY 1975

	Jan.	Feb.	Mar.	Apr.	May	CY/PY	A/F	CUM
Market 1		+	-			1.07	1.01	
Market 2	+		+	+		1.13	1.08	+
Market 3			-		+	1.20	.98	
Market 4		+				1.35	1.22	+
Market 5						.99	.96	
Market 6						.98	.94	
Market 7				+	-	1.02	.89	-
Market 8	+	+	+		+	1.24	1.31	+
Market 9		-	-		-	1.02	.83	-
Market 10	-		-	-	-	.97	.81	-
TOTALS						1.08	1.01	

KEY:

CY/PY .... RATIO: Current Year/Previous Year

A/F ...... RATIO: Actual/Forecast

CUM ...... Cumulative Exception to Date

\+ .... Actual Greater than Forecast

\- .... Actual Less than Forecast

Systems such as that outlined above have been implemented by the authors in several organizations. Yorke [18] gives details of one system that has proven to be managerially useful. Rao and Shapiro [13] develop some new, sophisticated forecasting methods that have proven to be useful in several forecasting systems. Rao and Lilien [14] show how the effects of promotion can be incorporated in a forecasting system to improve forecasting accuracy and to better assess the relative impact of promotional programs. Rao and Miller [15] describe some powerful methods of assessing the impact of product advertising on sales and indicate how these methods, too, can be incorporated into a forecasting and control system.

These developments are indicative of the state of the art. Systems and procedures are currently available for operational reporting and control of retail outlet performance which intelligently integrate models and data into managerially useful information. They invariably reduce the volume of reports, highlight important information, and indicate potential problems and opportunities in a timely, yet routine fashion. They integrate model building research into day to day operational control, and specify the parameters of a useful, usable management information system, and associated data base.

4.0 Conclusions

Our aim in this paper has been selective rather than exhaustive. We point out that quantitative approaches to problems of retail outlet management are emerging which are of use in problems of strategic and tactical planning as well as operational control. Underlying these approaches are a few key ideas:

1. Outlet share is generally related to share of market in a nonlinear way. This relationship bears important impact on the development of strategic building plans as well as in the evaluation of retail site operations.

2. Structuring the problem of evaluating site potential as

   potential = local component + transient component

   has been quite successful and should be exploited.

3. The heart of a good operational control procedure is a set of accurate forecasting models linked to exception reporting capabilities. Successful models have been developed which can greatly improve the operation of many such systems.

There is much need for new research in this field. However, there is much more need for integration and implementation of existing methodology. Many new tools and concepts are now available; the challenge to the multi-outlet retailer is to make use of them.

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