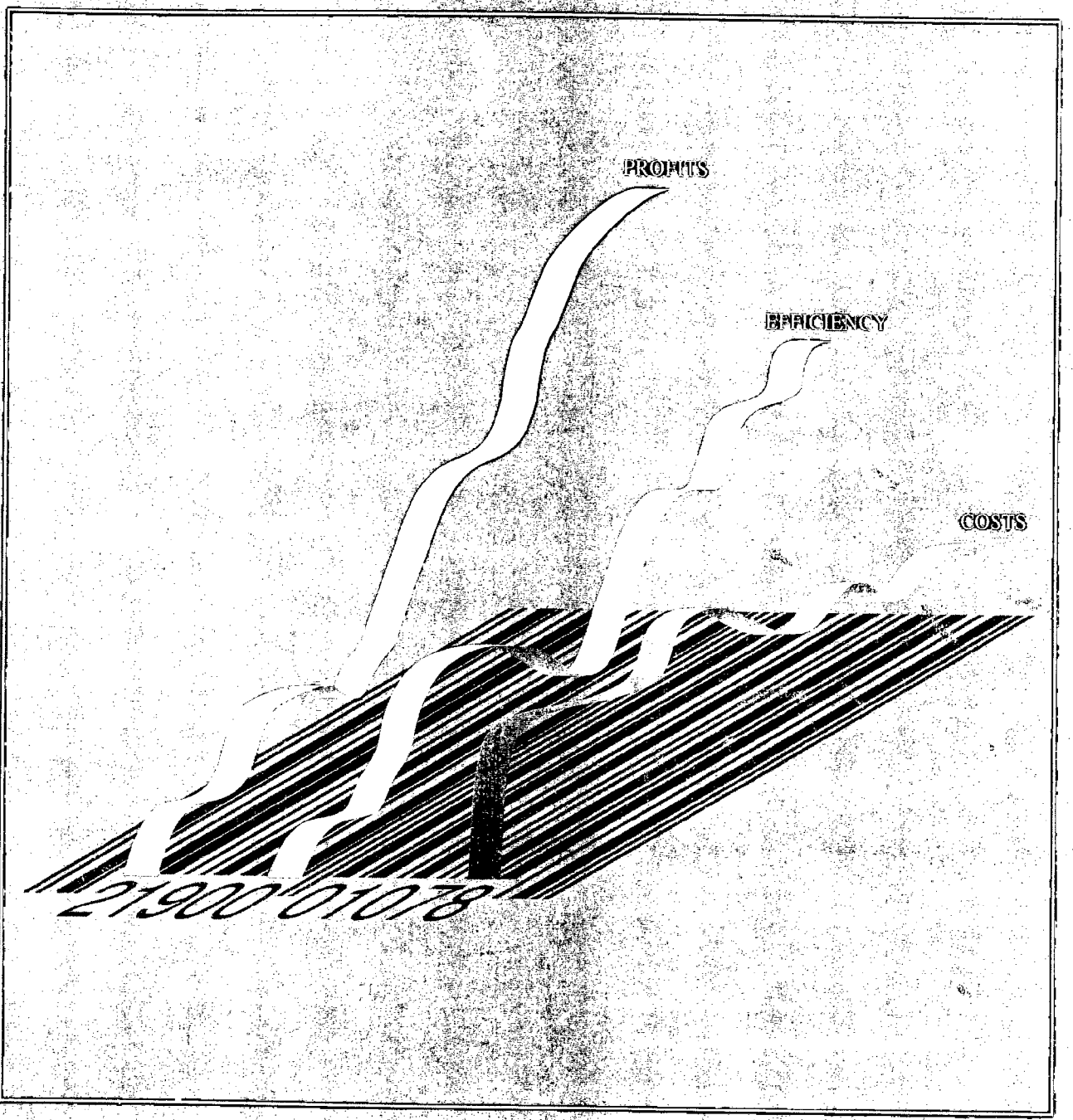
ASSESSING AND CAPTURING THE SOFT BENEFITS OF SCANNING



A STUDY CONDUCTED FOR THE
COCA-COLA RETAILING RESEARCH COUNCIL
BY ROBERT C. BLATTBERG

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MAY 1988

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by Robert C. Blattberg, Graduate School of Business, University of Chicago

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PREFACE

Scanning has been operational in U.S. supermarkets since 1974, and most food retailers have realized the hard benefits. Few, however, have been able to achieve the soft or informational benefits of scanning. One roadblock to progress has been the absence of a clear statement of the payout that can be realized from soft benefit applications of scanning.

Recognizing this need, the Coca-Cola Retailing Research Council undertook this study to help retailers to assess and capture the soft benefits of scanning. While scanning has many positive benefits, e.g., faster checkout, labor scheduling information, etc., this study focused only on an area that has not received much attention, i.e., the impact of scanning on product-related operating and merchandising decisions. It is important to emphasize that while scan applications not covered in this report are also important, the Council felt that a study focused in this area would be of greatest value to the retail food business.

The Council selected Dr. Robert Blattberg, Graduate School of Business, University of Chicago, to undertake this project. Professor Blattberg has been working with scan data since the mid-1970s and is a recognized academic authority in the field of marketing.

Members of the Coca-Cola Retailing Research Council who identified the industry need for this study and provided very cogent guidance as the study took final form are:

- Hugh C. Farrington, President
  Hannaford Brothers
  Scarsborough, ME
- Timothy M. Hammonds, Senior Vice President
  Food Marketing Institute
  Washington, DC
- Earl D. Holton, President
  Meijer, Inc.
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- Aaron Malinsky, President
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- Ronald D. Pearson, President & COO
  Hy-Vee Food Stores, Inc.
  Chariton, IA
- D.L. "Dent" Temples, Vice President
  Piggly Wiggly Southern, Inc.
  Vidalia, GA
- James E. Ukrop, President
  Ukrop's Super Markets, Inc.
  Richmond, VA

EXECUTIVE SUMMARY

The study describes the current state of the industry, identifies the highest priority application for scanning, makes recommendations about implementation and discusses the future of scanning-generated retail management activities.

CURRENT STATE OF SCANNING APPLICATIONS

- There are numerous applications available, but few are currently installed.
- Most top management among food retailing companies react ambivalently to scanning applications.
- Few organizations have strategic plans for integrating scanning applications into the company's overall management activities.
- Limited technical expertise exists for database management, software development, and data analysis required with scanner data.

HIGHEST PRIORITY APPLICATIONS

The highest priority applications are not necessarily those with the fastest payback. In fact, some of the higher priority applications are simpler and easier to implement than average. This report discusses the following high priority applications:

- Shelf Management Systems
- Price Simulators
- Promotional Analysis
- Perishable Management System
- Display and Ad Analysis
- Direct Product Profitability

No single company can implement all these applications simultaneously. However, the study offers the retailer a structured approach to gradual implementation.

One of the primary issues in evaluating scanning applications is how they fit together. Certain applications should be implemented first because they influence the retailer's subsequent ability to introduce other applications. Prominent in this category are Shelf Management Systems.

Before applications can be implemented, retail management should understand what obstacles can block the process.

OBSTACLES TO IMPLEMENTATION OF SCANNING APPLICATIONS

The following factors appear to limit the rate at which scanning data can be exploited in most retail food organizations:

- Too much data
- No scanning data "champion"
- No strategic planner assigned responsibility for scanning applications
- Lack of internal expertise
- Reluctance to use outside suppliers
- Poor data integrity

Successful implementation of scanning applications requires that these issues be addressed. Top management must identify key personnel who will be responsible for scanning applications. Top management will also need to spearhead the drive to make scanning data an integral part of the decision-making process within their organization.

ACTION PLAN FOR IMPLEMENTATION

Getting started is the key to realizing the benefits available from scanning applications. Initially, it is advisable to begin with small projects and then build on the experience gained. A specific plan is needed and should include:

1. Project Objectives and Payback
2. Needs Analysis
3. Output and Data Sources
4. Technical Requirements
5. Staffing Needs
6. Time Schedule and Check Points
7. Implementation Plan
   a. Build
   b. Test
   c. Revise
   d. Accept
8. Estimated Costs
9. Results and Feedback
10. Re-evaluation of the Process for the Next Application

A systematic evaluation of prior scanning experience can provide management with an understanding of past problems and to help avoid future difficulties.

FUTURE STATE OF SCANNING

Scanning applications offer retailers the opportunity to improve critical operating ratios. However, the path is long and arduous. Implementation of some applications just begins to pay out after five years. No single application will enable a retailer to dominate competitors; but, implementing several of them will help to improve operating results.

The future will likely bring a slow, but steady increase in the exploration of scanning applications. The implementation rate will be gradual with few retailers conspicuous for their boldness. Gradually, those exploiting scanning will differentiate themselves from those who do not. Signals are apt to include slow increases in market share, higher operating profits and gradual margin improvement and progress will not be readily apparent to competitors.

In the next ten years, many more retailers will adopt the technology. Computing costs will drop and the less-advanced firms will fall significantly behind their more progressive colleagues. A similar case is the slow erosion of the U.S. manufacturing base by the Japanese. This same fate might await today's successful retailer who remains complacent. After all, General Motors, U.S. Steel, and International Harvester were all Number One in their respective industries.

Where are they today?

I. INTRODUCTION

Much has been written about the soft or informational benefits of scanning, but the question remains: "Can a grocer gain a competitive advantage through the better use of scan data?" In many industries, from financial services to air transport firms, information has been used as a strategic tool. Yet, food retailing companies have not, for the most part, focused much energy towards accomplishing this goal.

When the chief executive officer of a food retailer or wholesaler assesses his priorities, using scan data is generally not given a high ranking. Scan applications do not appear to have the potential return that would be realized by adding more stores, remodeling existing stores, or making other types of investments. This limits the commitment of significant resources. Many companies find themselves in a "Catch-22" situation; i.e., there is no reason to invest in the use of scanning information because it does not appear to offer a return, and there is little effort made to determine if there can be a good return realized from scanning information. This report is offered to help companies break out of this dilemma.

This study has established that an investment in scanning can actually produce a competitive advantage with savings that can easily exceed twice those typically realized from the hard benefits. (Hard benefits are easily quantifiable benefits such as labor savings. Soft benefits are benefits which increase the firm's sales and profits but are difficult to quantify. An example is improved morale because items no longer need to be price stamped.) Perhaps more importantly, effective scanning applications are difficult for competitors to imitate because of their complexity. New store formats, changes in pricing, and new departments are more easily imitated by competitors. In contrast, a competitor cannot readily copy scan data applications so the advantage will be longer lasting.

How can scanning data applications provide a competitive advantage? The answer is that the effective use of scan data can lead to:

- Greater sales per square foot through improved space management.
- Higher margins and greater store traffic through better pricing, promotions, displays, and advertising.
- Lower inventory investment through better reorder decisions.
- Lower labor costs through automated reordering.

PURPOSE OF THE REPORT

The purpose of this report is to describe how a chain or wholesaler can approach the process of exploiting the value of scan data. Specifically, the report:

- Identifies and evaluates the potential applications of scan data.
- Develops a blueprint for implementing key scanner applications.

OVERVIEW OF THE REPORT

The report is divided into five major sections and four appendices. A brief description of each section is provided so the reader can refer to the section of immediate interest.

I. **Introduction**

II. **Scan Applications: Costs and Benefits.** Fifteen different applications of scan information are described and evaluated in terms of potential costs and benefits.

III. **Action Plan for Implementation.** The tactics a company can follow in selecting and installing scan data applications are outlined.

IV. **Case Study: How One Chain Implements Scanner Applications.** This section, which is based on the composite experience of a cross-section of companies, shows how to approach the process of implementing scan applications.

V. **The Retailer of the Future.** In order to provide the reader with a glimpse of what is possible when scan applications become an integral part of the business, this section describes a retailer in 1995. While no retailer is currently using every application, all the technology is currently available to do so.

Appendices. Appendix A provides a more detailed description of each of the primary applications. Appendix B briefly describes several other applications related to scanning but since they go beyond the use of scanning information, they are not included in the body of this report. Appendix C outlines the study methodology and Appendix D lists the study participants.

II. SCAN APPLICATIONS: COSTS AND BENEFITS

One of the first questions that must be answered is, "What do we do with scan data to improve our business?" The answer is, unfortunately, neither easy nor obvious. This section of the report is designed to help food retail and wholesale executives understand how scan data can be used to improve their business. Perhaps more importantly, it contains estimates of the costs and benefits of each application. The applications included in this section were gathered through interviews with a broad cross-section of leading food retailers and wholesalers as well as interviews with scan equipment manufacturers, consultants and service providers experienced in scan data applications. The applications are divided into three categories: (1) operations, (2) merchandising and marketing, and (3) other.

Appendix A provides greater detail for each application discussed in this section. Appendix B briefly describes several applications excluded from this section either because they are more futuristic or appear to be less important.

The core of this section is an evaluation of the costs and benefits of each application. To make the results of this evaluation more useful and realistic, the evaluation has been conducted within the context of a hypothetical regional chain of 50 stores, averaging sales of $10 million per store per year. Since the dry grocery department is the primary beneficiary of many of the applications, sales will be multiplied by 50% (dry grocery's share of the store), resulting in $250,000,000 in dry grocery sales for the chain. Gross margins are assumed to be 18% for dry grocery and 25% for the entire store.

A company of this size was selected in recognition of the fact that it may be difficult for smaller companies to commit the resources needed to develop certain applications. In these situations, it is anticipated that a wholesaler is in a strong position to undertake the development of scan applications on behalf of his retail customers.

Recognizing that any estimates of the costs and benefits of a specific application must be based on a number of assumptions, each assumption has been stated so that the reader can both understand the basis of the calculation and, if desired, modify the assumptions to more closely correspond to his/her own situation.

HOW APPLICATIONS AFFECT RETAILER PROFITABILITY

Table II-1 shows how the applications influence retailer profitability. Five operating ratios have been selected: (1) Inventory turns, (2) Sales per square foot, (3) Gross margin dollars, (4) Labor costs, and (5) Promotion costs.

Generally, the "operations" applications influence inventory turns, sales per square foot and gross margin dollars. Similarly, the merchandising and marketing applications generally affect gross margin dollars, promotional costs, and sales per square foot.

Table II-1
OPERATING RATIOS AFFECTED BY EACH APPLICATION

Application	Inventory Turns	Sale per sq. ft.	Gross Margin Dollars	Labor Costs	Promotion Costs
Shelf Management Systems	✧	✧	✧	✧	
Computer-Assisted Ordering	✧	✧		✧	
Perishable Management System	✧	✧	✧	✧	
Direct Product Profitability	✧	✧	✧	✧	✧
Promotional Analysis	✧	✧	✧	✧	✧
Display and Ad Analysis	✧	✧	✧	✧	✧
Price Simulators			✧	✧	✧
Price Elasticity Models		✧	✧		
Localized Marketing	✧	✧	✧		
Basket Analysis		✧	✧		
Direct Marketing		✧	✧		✧

DESCRIPTION AND ANALYSIS OF APPLICATIONS

Operations Applications

SHELF MANAGEMENT SYSTEMS

Currently, one of the most popular scan applications is shelf management. This activity creates departmental planograms based on item movement, case packs, and product dimensions. Space allocations are periodically updated using scanner data to reflect changing product movement.

Most shelf management activity is currently focused on either the development of company-wide planograms or planograms for clusters of "like" stores. Eventually planograms may be developed for individual stores, but for most companies this is still in the future.

Application Costs – The initial cost of the space management system can be substantial, i.e., approximately $75,000 for hardware and $30,000 for copies of the software. It is assumed that the chain will buy three copies. In addition, it is estimated that three full-time equivalent people will be required at a cost of $50,000 each to install the system.

Ongoing costs for operation of the space management system can also be significant. It is assumed two full time equivalents ($40,000 per person) will be required to maintain the databases and update the information. One full time equivalent will also be required to communicate the information to the stores ($40,000).

Applications Benefits – Incremental profits come from three sources: reduced inventories, lower out-of-stocks, and increased sales and profit. The benefits result from improved merchandising of existing products and the introduction of new product lines that otherwise would not fit on the shelf.

Since the store is not ordering items that have sufficient on-hand inventory, investment in inventory is lower. Suppose the system reduces the on-hand inventory by 5%. Assuming inventory is 10% of sales (10 turns per year) and carrying costs are 12%, the total savings from reduced inventory is .06% of sales.

Another source of savings is reduced out-of-stocks. It is assumed that the out-of-stocks equal 3% of sales and only half of the out-of-stock sales are lost. It is also assumed that the gross margin on these sales is 18%. However, the savings attributable to shelf management are only estimated to be 1/4 of the out-of-stock losses because space management only applies to shelf space allocations. Under these assumptions, the profit gain resulting from reduced out-of-stocks will equal .0675% of sales [(1.5% x .18)/4].

The third source of profits comes from adding new items in the store. Assume that for every 20 categories studied, a chain can reduce the space allocated to make room for one new category. The new category will likely have lower-than-average sales. Assume the new category has a sales volume of 10% of the average store volume resulting in a sales increase of .50% (1/20 x .10%). If gross margin is 18%, then profits will increase approximately .09% of sales.

Adding all sources results in incremental profit of .2175% of sales.

Application Evaluation – For a chain with $250,000,000 in dry grocery sales, this application can generate approximately $543,750 per year in gross benefits (.2175% of sales). With initial installation costs of $315,000 and annual operating costs of $120,000, the system could pay for itself in the first year.

Summary:

1. The purchase price of a shelf management system is approximately $165,000 for a fifty store chain.
2. The cost of installation is approximately $150,000 (three person years from the system staff).
3. The on-going labor costs are $120,000 per year.

4. The estimated increases in profits are:
   a. 0.06% of dry grocery sales from inventory savings.
   b. 0.0675% of dry grocery sales from reduced out of stocks.
   c. 0.09% of dry grocery sales from higher volume, including new categories and items added.
5. Conclusion: The payback from the system is less than one year.

COMPUTER-ASSISTED ORDERING

Item movement, on-hand inventory, shipping schedules and lead times are the key elements in developing a computer-assisted ordering (CAO) system. The system uses scan data to track item movement and compute perpetual inventory.

A sophisticated computer-assisted ordering system typically requires the following:

- Databases to run the system
- Forecasts of daily item movement
- Promotional buying and ordering
- Perpetual inventory
- Ability to override the system
- Reorder points
- Shelf allocations
- Order quantities
- Scan data integrity
- Delivery cycles
- Training, support and maintenance

It is, clearly, a complex system to install.

The primary benefits of computer-assisted ordering are a reduction of inventories and reduced out-of-stocks. Some of the calculations are similar to shelf management systems even though shelf management systems do not require perpetual inventory.

Application Costs – One company with a CAO system reported that it was installed for less than $100,000. The annual operating cost is roughly $3,500 per store. Additional costs include the calculation of a perpetual inventory. The perpetual inventory system would cost approximately $350,000 to develop with an annual operating expense of $150,000.

Applications Benefits – Again, assume that the retailer has an out-of-stock of 3%. Assume that half of the out-of-stock sales are lost and the gross margin is 18%. No other costs are incurred. This translates into .27% (3% x .50 x 18%) of sales.

Since the system does not order items that already have sufficient on-hand inventory, more money is saved. As with shelf management systems, suppose the system reduces the on-hand inventory by 5%. If the inventory is 10% of sales (10 turns per year), then inventory is reduced by .5% of sales. Assuming 12% carrying costs, the total savings from reduced inventories are .06% of sales.

Overall, there is a profit gain equal to .33% of dry grocery sales.

Application Evaluation – For a chain that generates $250,000,000 in dry grocery sales, the annual incremental profit is $825,000. The cost of the system includes $450,000 initial investment and ongoing operating costs of $325,000 per year, resulting in an application that can pay for itself in the first year.

Summary:

1. The initial investment required is:
   - $100,000 for the basic system
   - $350,000 for a perpetual inventory system
2. On-going maintenance is:
   - $175,000 per year (50 stores times $3,500)
   - $150,000 per year for maintaining the perpetual inventory system
3. The increased profit results from reduced out-of-stock and reduced inventory which equals .33% of sales.
4. Conclusion: Using a retailer with dry grocery sales of $250,000,000 the economic payback occurs within one year from installation.

Merchandising and Marketing Applications

PERISHABLE MANAGEMENT SYSTEM

For the produce, delicatessen, meat, and bakery departments, scan information, combined with shipment data, helps identify items with excessively high spoilage and shrinkage. The system works like computer-assisted ordering (CAO), but its focus is directed at reducing spoilage rather than automating ordering.

The perishable management system requires:

- Forecasting item movement
- Knowledge of promotional events
- Seasonality
- Deliveries (DSD system)
- Item movement

Applications Cost – The system records both deliveries and units sold by store. Across all perishables, 300–500 SKU's will need to be tracked. A micro-computer program must be developed that provides daily demand forecasts based on an inexpensive forecasting package. Software development should total $50,000 to $75,000 (1 to 1.5 person-years). Data entry from the POS system to the micro computer requires another person year to program which is $50,000. On-going maintenance costs will be one full time equivalent at $50,000. Micro computers can be purchased for $3,000 and the software cost is estimated to be $500 per store.

Application Benefits – Studies conducted on a similar system in the produce department of a chain showed an increase of profits of 5%. This figure is divided by 3 because the average savings across all perishable departments will be less than produce. Assuming the items analyzed in the perishable departments represent 35% of the store's sales, with a gross margin of 30%, the benefit of the application is equal to .175% of sales (1.67% x 30% x 35%).

Applications Evaluation – For this chain, this yields $875,000 in extra gross profit per year. Development, hardware, and software costs are $300,000 for a fifty store chain and therefore, the payback is within one year. With low on-going maintenance expenses, profits should be very high after the initial year.

Summary:

1. The initial investment cost is $125,000 for software development and data entry, plus $175,000 in computer and software costs (for a 50 store chain).
2. On-going maintenance is estimated to be $50,000 per year.
3. The economic gain is estimated to be .175% of total store sales or 15% of perishable sales.
4. Conclusion: For a 50 store chain the payback is within one year.

DIRECT PRODUCT PROFITABILITY

Grocery retailers have begun to develop profit reporting at the store, department, and item levels. To use direct product profitability (DPP) as an ***on-going*** monitoring tool, retailers can employ weekly scan information by item. DPP is a better measure of profit because it considers not only the purchase cost of an item but also the cost to actually handle that product. By combining average inventory, scan data, current planograms, and cost data, the DPP of each item can be calculated periodically.

Application Costs – Based on the experience of several companies that have recently begun to utilize DPP, it appears that the primary costs involve learning the system and entering the information. The software is not particularly complex, since it applies basic accounting computations, and is available today from the Food Marketing Institute (FMI). The initial data collection for cost and productivity factors requires 1/4 person year ($12,500).

For the system to be most effective, it should be actively used at store level. Then, store managers can "fine tune" their merchandising mix based on item DPP. System labor costs amount to one person devoting five hours per week. If this person is paid $30,000 per year including fringe benefits, the annual cost is $3,750 per year, per store.

In addition, someone at headquarters must maintain the product dimensions and other product and cost information. Costs, margins, and product movement must be downloaded or captured from the store's computer. A current planogram and on-hand inventories are also required. The planogram can come from a space management system, the on-hand inventory from the perpetual inventory system or average inventory can be used. This adds another 1/2 full time person for maintenance at $50,000 per year or $25,000.

Applications Benefits – The expected profit increase comes from deleting unprofitable items and adding profitable items. In addition, it may be possible to improve the DPP for an item by repricing it or reducing its shelf space.

Assume that a store has 3% unprofitable items that can be affected through a DPP-based analysis and that by substituting new items, sales increase by 1.0%. Then, if the gross margin is 18%, the increase in profit from using DPP is .18% of sales (.01 x 18%).

Applications Evaluation – For a chain with $250,000,000 in dry grocery sales per year, the increase in profits is $450,000. The costs directly attributed to a store are $3,750 for labor to manage its DPP program. Over the 50 stores this amounts to $187,500.

Summary:

1. The cost of the initial DPP software and development is relatively inexpensive, $12,500.
2. The primary cost, which involves the labor to maintain the system, is $187,500 ($3,750 per store) and $25,000 (fixed headquarters cost) per year.
3. The savings come from deleting unprofitable items and substituting new items, which are estimated to be .18% of dry grocery sales.
4. Conclusion: The potential benefits of DPP implies that the application can pay for itself in the first year.

PROMOTIONAL ANALYSIS

Since weekly promotional features are a primary way to vary price, it can be very useful to analyze their effects on sales and profitability. There are at least two approaches that can be taken in promotional analysis.

Simple Analysis – This approach employs a basic "before-after" measurement technique. A promotion is run and the sales before, during, and after the promotion are determined. Then, an estimate is made of what sales would have been during the period, assuming no promotion was run on the item. This is usually based on the "before" sales volume. Next, the sales for the three periods are compared and the profitability of the promotion is computed.

Complex Analysis – The alternative method is to use a statistical model to forecast what sales would be if no promotion is run. The model can adjust for other events occurring before and during the promotion. In theory, this model should work better than "before-after" analysis because it explicitly considers other factors that typically impact the sales and profit generated by a feature item.

The economic evaluation focuses on simple promotional analysis. The system required for this application is not very costly to develop except, perhaps, for on-going data extraction. The key to successful application is maintaining a sales history database and then regularly computing the "before-after" payout for promotions.

Application Costs – These costs can be divided into two parts: development of software to perform the before-after computations, and providing hardware and software for tracking promotions.

The software for the "before-after" analysis can be developed using one person-year or approximately $50,000. Computations are simple, but the requirement to download information from the mainframe may be more complex.

Effective downloading requires development of a database. This involves the capability to routinely extract data from the mainframe. These data include product category information about the deal price, advertising features, display activity, trade deals received, cost of other items in category, and any advertising and display allowances received. The initial development cost for this capability is in the range of 2 person-years or $100,000 to design the programs and files, and then $40,000 per year to maintain the system, i.e., a full-time programmer.

Application Benefits – It is assumed that promoted items account for 20% of a category's volume in the major categories. Further assume that by analyzing promotions and changing strategies, the margin of the promoted item increases by 5%. This means that category profits increase by .18% (20% x 5% x 18%) of sales. Next, it is assumed that 50% of store sales are from heavily promoted categories. This means that the expected return on sales from the system is .09% (.18% x 50%) of sales.

Application Evaluation – With a 50 store chain selling $250,000,000 in dry grocery per year, the profit before costs is $225,000. The development cost is $150,000 to develop and $40,000 per year to maintain. Thus, it would appear to have a high return after the initial development. However, these returns accrue only if the merchandisers change their promotional strategies which means training merchandisers to use the data effectively.

Summary:

1. The one time cost is about $150,000.
2. On-going maintenance costs are $40,000.
3. Conclusion: The expected return is .09% of dry grocery sales but is dependent on changing promotional strategies and the merchandisers using the system.

DISPLAY AND AD ANALYSIS

This system determines the profitability of a display and/or an advertisement. It involves comparing changes in item movement when display or advertising space is devoted to an item versus when no display or advertising space is used. First, a pre-display measure of normal item movement is computed from scan data. Then, this figure is compared to item movement during and after the promotion. The difference between movement before and during the promotion is attributable to the advertisement and display. Since some of the sales increase comes from a price decrease, adjustments are needed to account for the special price offer.

Ideally, a display and ad system should be developed in conjunction with a promotional analysis system, since the same information is collected for each. There can be a problem with display information because store managers occasionally do not follow the action recommended by headquarters.

Application Costs – A microcomputer system can be designed relatively easily. The primary cost is related to developing the ability to extract the sales and promotional history. It is estimated that programming will cost .5 person-years or $25,000 for the micro system and one-man year, $50,000, for the data extraction. Maintaining the database will require one full time person at $30,000 per year.

Application Benefits – Incremental profit can be realized from both the advertising and display applications. For the former, suppose that items advertised represent 6% of store sales. If, by advertising higher-profit items, margins are increased by 1%, the overall gain is then .06% of sales (6% x 1%).

With display analysis, the performance of each display is measured to determine relative profitability so that store personnel can begin to change display strategies. By displaying higher profit items along with necessary high-volume items, higher profit per display will result.

Assume that by appropriately managing the length of time a display is up and selecting better items to display, the sales will increase .1%. With a gross margin of 18%, the incremental profit increase is .018%.

Since both the ad and display applications use the same software, the total increase is expected to be .078% of sales.

Application Evaluation – Using the standard chain, the profit is $195,000. The cost is $75,000 to develop the system and $30,000 per year to maintain it.

Summary:

1. The cost of the application is $75,000 for systems development plus $30,000 per year for data production and maintenance.
2. The economic gain is estimated to be .078% of dry grocery sales.
3. Conclusion: This application produces a significant gain relative to cost.

PRICE SIMULATORS

Price simulators have been developed by a number of companies to analyze the impact of pricing decisions. These systems evaluate the profitability of changing prices within a product category. The simplest forms of this application are spreadsheet programs which allow the user to vary price and do "what if" analyses.

Applications Cost – Price simulators cost approximately one person-year ($50,000) to develop. The systems probably should be developed on microcomputers since the software is less expensive.

An additional development cost is the maintenance of pricing information. The system must extract price data weekly. The cost of writing data extract programs is roughly .5 person years or $25,000. On-going maintenance costs approximately equal one full-time equivalent at $35,000 per year.

Applications Benefits – The economic gain from using a price simulator is difficult to estimate. Suppose 5% of store items are repriced using this system with the price of half being increased and half being decreased. For those items with price increases, assume the margins rise 2% with a 1% loss of sales. For those items with price decreases, margins fall 2% and sales rise 15%. Further, assume that the average margin is 18%. For the items experiencing price increases, the added profit will be (20% x .99 – 18% x 1.00) x 2.5% = .045%. For those items with price decreases, the profit will be (16% x 1.15 – 18% x 1.00) x 2.5% = .01%. The total profit improvement is .055%.

Application Evaluation – For the standard chain, an increase in profits of .055% results in $137,500 per year. The development cost is approximately $75,000 and the maintenance cost is $35,000 per year.

Summary:

1. Cost of development is roughly $75,000.
2. On-going maintenance costs run about $35,000 per year.
3. Profit increase from a price simulator are assumed to be about .055% of dry grocery sales.
4. Conclusion: This application produces strong returns relative to costs.

PRICE ELASTICITY MODELS

A price elasticity model determines the effect of price changes on sales. It differs from a simulator in that it uses statistical methods to determine an item's optimal price. Scan data provides the necessary sales and price information. Prices of competitive retailers and "close substitutes" must also be considered. The advantage of this type of model is that it indicates which items are incorrectly priced. It helps eliminate the guesswork currently existing in many pricing decisions.

Both the cost and expected return of a price elasticity model are high. The costs are high because models must be developed for each product category.

Applications Cost – The initial model development cost is approximately $50,000 (one person year) plus $5–10,000 per category. In addition, since the models only recommend price changes, experiments must be run to verify the findings. Assuming that there are sixty categories in a grocery store, the model's total cost would be $650,000. There is also an annual updating cost of approximately $3,000 per category which represents another $180,000.

Applications Benefits – The profit increase depends on the efficiency of the price increases. By selecting only categories with low elasticities for price increases, large sales reductions can be avoided. Assuming that 30% of the categories could receive price increases with a loss of sales of 1%, the items represent 15% of sales in each category, and assuming that margins increase from 18% to 20% on these categories, then profit will increase by (20% x .99) – (18% x 1.00) = 1.8%. Multiplying this figure by .15 gives .27% of sales and then multiplying by 30% gives .081%. However, this benefit assumes successful identification of low-elasticity categories.

Application Evaluation – For the standard chain, the increased profit is $202,500, i.e., .081% of sales. The one time development cost is about $650,000, and the annual maintenance is $180,000.

Summary:

1. The cost of building price elasticity models for all categories is high, i.e., $650,000.
2. An on-going cost of $180,000 per year ($3,000 per category) is required assuming that models are built for sixty categories.
3. The expected return from this application is in the range of .081% of dry grocery sales.
4. Conclusion: This application produces a positive return after year 1, but once the models are built, it is very important to validate them through controlled experiments.

LOCALIZED MARKETING

Local marketing can generate increased sales by customizing a store's merchandising mix. To succeed, a retailer must know area demographics in order to develop an appropriate merchandising program.

Most chains use some form of zone pricing, and some also make more modifications in merchandising by local area. Far more sophisticated approaches can be developed using scan data. Each store or cluster of similar stores could receive a different layout and merchandise mix, depending on its sales pattern. In addition, space management systems can be tailored to each store with layouts reflecting individual category and item sales. Pricing could be based on price elasticities for the items in that store. Advertising and promotions can be varied according to socio-demographic segments served.

Applications Cost – The development cost is affected by the other systems in place. If there are store level space management and DPP systems, then the cost can be fairly low. Developing the capability to manage all the information, however, is quite costly. A personal computer is required for each store in addition to database management software, modems, and printers. The cost is estimated to be $3,500 per store.

The primary implementation challenge is training and monitoring store management. This application can be used quite easily by independents, but represents more of a challenge for chains. Unless the chain is disciplined, individual stores will vary greatly on pricing and merchandising, destroying overall image and positioning. Therefore, the major cost for a chain is the management effort to reconcile store autonomy with presenting a uniform image to customers. The cost of this application cannot be adequately quantified in this study.

Applications Benefits – To estimate incremental profits, it is assumed that 5% of store items will be affected, resulting in a 25% sales increase per item. Further assume that sales of the items changed represent 1% of stores sales, which, therefore, will increase by .25% (25% x 1%). Then, assuming 30% margins on the new items, the overall increase in profits would be .075% (.25% x 30%) of sales. This estimate may be high, but it demonstrates the advantage of adding targeted specialty merchandise. Many stores are already doing some form of local marketing. Using scan data to control merchandising will extend the process.

Application Evaluation – For the standard chain, this application spans all categories so the profit increase is $375,000 per year and the initial cost is $175,000. On-going costs relate to management time.

Summary:

1. The cost of localized marketing is relatively low if the chain already has DPP and shelf management systems in place. The estimated cost of additional equipment and data maintenance is $3,500 per store or $175,000 for a 50 store chain.
2. Resources are also needed for a management system to maintain a consistent chain image and allow local autonomy for merchandising, and, in some cases, pricing. The annual cost of these resources is estimated at $100,000.
3. The expected profit increase is a substantial .075% of total chain sales.
4. Conclusion: Once other modern merchandising applications are in place, this can be a very productive application.

BASKET ANALYSIS

The purpose of "basket" analysis is to analyze customer cross-buying and the product penetration of different households. It is used in developing specific merchandising programs.

"Basket" analysis involves recording all items purchased by each household (or sample of households) on a given shopping trip, i.e., each time a customer goes through the checkout line, his/her purchases are recorded as a market basket.

The primary purpose for basket analysis is to better understand product penetration analysis and cross-buying. Product penetration focuses on determining which items are purchased by a high percentage of the households. Once identified, these items can then be used to more effectively attract customers. Penetration analysis also helps identify those items purchased by a low percentage of households on a given trip so that they can be considered for retail price increases. Cross-buying of items allows the retailer to determine whether certain items are complementary, e.g., if tomato sauce is purchased, does high percentage of households purchase pasta? If so, cross-promotions and other merchandising opportunities can be utilized to take advantage of cross-buying.

The ultimate goal of basket analysis is to improve the portfolio of items being promoted and merchandised.

Applications Cost – Assume that the initial software costs a retailer $100,000 to either purchase and install or to design internally. The cost is related to the ability to capture the information from the store efficiently and to upload this information daily.

Because basket analysis generates such large quantities of data, computer storage capacity must be increased significantly. The cost for additional disk space is estimated to be in the range of $125,000. (This is based on five disks at $25,000 per disk.)

Analytical software is needed to analyze all the information generated. Existing computer software such as SAS or SPSS can be used and costs approximately $10,000 per year to license. An analytical staff is required to work with the data at a cost of $100,000 in the first year and $50,000

in subsequent years. Computer costs for analyzing the data are estimated at $50,000 per year, based on using outside time-sharing services for the analysis. Otherwise, additional hardware may be needed internally.

Application Benefits – Assume that 5% of the items run on promotion could be repriced higher and 5% repriced lower based on basket analysis. Assume the net result is a .5% increase in store traffic and corresponding .25% increase in sales. Then, assuming margins across all items in the store are 25%, the result is a .0625% increase in profits as a percentage of sales.

Application Evaluation – Since this application spans all categories, sales are assumed to be $500,000,000 for the standard chain. The incremental profit is .0625% of sales or $312,500. To achieve these results, however, the retailer must devote considerable effort to determining how to change the promotional mix of the products.

Summary:

1. The initial investment is:
   Software $100,000
   Storage Costs.....$125,000
   Analytical Staff $100,000
2. On-going costs are:
   Software licenses.....$10,000
   Staff $50,000
   Computing Costs $50,000
3. The return is estimated to be .0625% of total chain sales or $312,500 per year.
4. Conclusion: A successful application requires a strong focus on changing the mix of promotional items and repricing some of the items to exploit consumer cross-buying behavior.

DIRECT MARKETING

With the opportunity to track purchases using customer identification cards, programs can be directed toward specific individuals. The promotions will depend upon past purchases. Direct marketers are adept at using recency, frequency, and monetary (RFM) to target promotions. RFM indicates when the customer last purchased (Recency), how often has he/she purchased (Frequency) and how much has he/she spent (Monetary). All customers are categorized into different RFM cells. The response rate and expenditure level is determined for each cell. A specific promotional strategy is then tailored for each RFM cell. Food retailers can use similar approaches to target customers. Direct marketers also design promotions based on the item mix purchased. The same techniques can be applied to food retailing. The primary requirement is the recording of purchase histories via scanners.

Applications Cost – Developing a system to market to individuals can be very costly because of the extensive data maintenance required. Assume an average store has 10,000 customers (not all of whom shop every week), who purchase 30 items per week, times 50 weeks per year. This equals 1,500 items purchased per customer, per year. Thus, the size of the database for one store can be quite large. The data must, therefore, be consolidated in some manner. The simplest method is to maintain information by category or some type of summary measure. However, the more collapsed the information, the less valuable it becomes for marketing purposes.

The cost of maintaining this large database is in the range of $300,000 to $400,000 per year. The cost of creating the initial system may be as high as $1,000,000.

Applications Benefits – If successful, this system could increase sales by 1%. By targeting individuals with the appropriate coupons, the system increases shopping frequency and purchases per visit. Further, it reduces advertising cost. Rather than a general advertisement, messages could be aimed at specific targets. Based on incremental sales and assuming a 25% margin, increased profit is .25% of sales. The savings from advertising is difficult to estimate but could easily reach $100,000 per year.

Application Evaluation – Again, since this application affects all items, sales are $500,000,000 and the profit increase is $1,250,000 per year plus the advertising savings. However, the cost is also very high: $1,000,000 to create the system and $400,000 per year for maintenance. Until computing costs decrease and a system is developed to easily maintain large databases, it is recommended that this application be delayed. Costs should decrease over time.

Summary:

1. Direct marketing can be very expensive, with a initial cost of $1,000,000 and an annual cost of $400,000.
2. The profit from increased sales is estimated to be .25% of total chain sales plus savings from reduced advertising spending.
3. Conclusion: This application requires large database management systems and should be delayed until equipment and processing costs decrease.

SUMMARY OF ECONOMIC ANALYSIS OF SCANNER APPLICATIONS

Table II-2 shows a financial summary of the economic benefits of scan applications. It shows costs, economic gains, and firstyear payout. This information is used in the next section as part of the application ranking.

Table II-2
ECONOMICS OF SCAN APPLICATIONS

APPLICATION	COST ($)		ECONOMIC GAIN		FIRST YEAR PAYOUT
	Install	On-going	(% sales)	Dollars ($)	Ratio
Perishable Management System	$300,000	$50,000	** 0.50%	$875,000	2.50
Direct Product Profitability	12,500	212,500	* 0.18	450,000	2.00
Display and Ad Analysis	75,000	30,000	* 0.078	195,000	1.86
Localized Marketing	175,000	100,000	***0.075	375,000	1.36
Price Simulators	75,000	35,000	* 0.055	137,500	1.25
Shelf Management Systems	315,000	120,000	* 0.2175	543,750	1.25
Promotional Analysis	150,000	40,000	* 0.09	225,000	1.18
Computer Assisted Ordering (1)	450,000	325,000	* 0.33	825,000	1.06
Direct Marketing	1,000,000	400,000	***0.25	1,250,000	0.89
Basket Analysis	325,000	110,000	***0.0625	312,500	0.72
Price Elasticity Models	650,000	180,000	* 0.081	202,500	0.24

* Dry Grocery Sales (50% of total)
** Perishable Sales (35% of total)
*** Total Store Sales

Assumptions: 50 store chain with $10,000,000 annual sales per store
50 week year with 50% of the stores' sales coming from dry grocery
Standard profit margin is 18%
60 categories carried per store

Note: (1) Computer-assisted ordering and direct product profitability include perpetual inventory costs.

PRIORITY OF APPLICATIONS

In this section the applications discussed earlier are evaluated and prioritized. Ranking is judgmental since other weights and scores could have been used for each application. The scores and weights are given so the reader can revise them and generate his/her own ranking, if desired.

Criteria Used to Evaluate Applications

Seven different criteria were used to determine the rankings. A brief description for each is given below.

1. Sophistication of the Application

Sophistication relates to the level of statistical and data processing skills required to design and implement an application. The greater the sophistication required, the lower the ranking.

2. Availability of Software

Acquiring the application from an outside vendor can speed development time and simplify implementation. Therefore, an application available externally receives a higher ranking.

3. Quality of the Data Required

Data quality affects some applications. Most retailers require time to improve data quality prior to implementing certain techniques. If the application requires good quality data, it is ranked lower.

4. Time to Complete the Application

Some applications, with very high potential payout, also require a long implementation period. The longer the implementation time, the lower the ranking.

5. Ease of Implementation

Ease of implementation is related to availability of data required and user ability/willingness to realize the value of the application. Easier to implement applications are ranked higher.

6. Potential Payout

This ranking is based on the ratio of the applications benefits to the first year's investment plus annual operating expenses. Applications with the higher potential payout ratios receive higher rankings.

7. Is the Application Currently Used by Retailers or Wholesalers?

The final criterion reflects whether the application is being currently used. If used more extensively, then it received a higher ranking.

RANKINGS

Table II-3 shows the ranking for each application. The total score for an application is calculated by multiplying the value for each criterion times the ranking and then summing across all seven criteria. A brief summary of the results are provided below.

Top Group – These applications warrant top priority: (1) Perishable Management System, (2) Direct Product Profitability, (3) Display and Ad Analysis, (4) Promotional Analysis.

Promotional systems and Display and Ad Analysis are valuable because they automate existing procedures. They require scanning data but not lengthy histories or complex models. In addition, they will aid the introduction of more complex pricing and promotional systems. A Perishable Management System has a high payout because it represents a significant percent of the store sales (35%) and is relatively low cost to develop. Direct Product Profitability has a high payout because it "fine-tunes" the merchandising mix.

Middle Group – This group represents a wide range of applications. Price Simulators and Shelf Management help the merchandisers. Localized Marketing and Basket Analysis attract customers.

Bottom Group – In the bottom group are the most complex applications which include Computer-Assisted Ordering, Direct Marketing, and Price Elasticity Models. While Computer-Assisted Ordering has a moderately high payout, the time required and difficulty of implementation places it lower on the list.

Table II-3
EVALUATION AND RANK ORDERING OF THE APPLICATIONS

Application	Criteria for Evaluating Applications								
	Soph	Avail	Data Qual	Time	Ease	Payout	Use	Total	Rank
Weight	*15*	*5*	*15*	*10*	*10*	*35*	*5*		
Perishable Management System	6	2	4	5	8	10	3	655	1
Direct Product Profitability	5	10	4	5	5	7	8	570	2
Display and Ad Analysis	4	2	2	7	6	9	3	560	3
Promotional Analysis	6	4	2	7	7	7	3	540	4
Price Simulators	7	2	4	7	8	5	7	535	5
Shelf Management Systems	5	10	4	5	5	5	10	510	6
Localized Marketing	2	3	6	3	3	6	3	420	7
Basket Analysis	4	7	6	4	3	2	2	335	8
Computer-Assisted Ordering	3	8	1	2	2	4	4	300	9
Direct Marketing	1	3	3	5	2	2	1	220	10
Price Elasticity Models	2	1	1	1	2	2	1	155	11

Table II-3 (Continued)
EVALUATION AND RANK ORDERING OF THE APPLICATIONS

Criteria	Symbol	Weight
Sophistication of the Application (1 = High, 10 = Low)	Soph	15
Outside Vendor Supplying Service (1=None, 10=Many)	Avail	5
Quality of Data Required (1=High, 10=Low)	Data Qual	15
Time to Complete (1=Long, 10=Short)	Time	10
Ease of Implementation (1=Difficult, 10=Easy)	Ease	10
Potential Payout (1=Low, 10=High)	Payout	35
Used By Other Retailers/Wholesalers (1 = Low, 10 = High)	Use	5

III. ACTION PLAN FOR IMPLEMENTATION

Once a commitment is made to develop scan applications, management must establish a plan to integrate them into the company's routines.

SELECTING AN APPLICATION

Choosing the first application is not a simple task. While most organizations initially stress the highest payout applications, this may not be the best strategy. A simple application which helps people within the company begin to appreciate the value of scan data applications is a good place to start even if the immediate returns are small. Therefore, it is suggested that inexperienced retailers begin with simpler projects. **Getting started on a successful application is the key to successful implementation. The trick is to keep the initial project small and then build on the experience.**

Several excellent possible choices for initial applications are Perishable Management Systems, simple Price Simulators, and before-after Promotional Analysis systems. Applications using third-party software and expertise are also good candidates.

RECOGNIZING SHARED REQUIREMENTS AMONG APPLICATIONS

A close look at the steps required to implement applications reveals that certain software, data management systems, and internal expertise are required by more than one application. For example, hardware purchases (microcomputer) are required in many applications.

Table III-1 lists certain shared requirements. The table shows that a UPC database, promotional histories, and scanner data integrity are required for most applications. Retailers and wholesalers should begin to focus on these issues as a necessary step toward implementing a given application.

These commonly shared requirements are important for two reasons. First, they help to highlight the "building block" nature of some applications, i.e., it is not possible to jump directly into them without a very large investment. Second, they suggest opportunities in which the cost of implementing two or more applications can be reduced by sharing the cost of certain requirements.

COMMON PROBLEMS IN IMPLEMENTING APPLICATIONS

The implementation effort should address several issues.

Quality of Scan Data

The first issue is the quality of scan data. Data integrity is critical for applications focusing directly on the performance of individual items, e.g., perpetual inventories, Computer-Assisted Ordering and some of the promotional and pricing models. Without disciplined data collection, it is easy for sales of an individual item to register higher (because one flavor or type is used for all flavors or types) or lower volumes (items not scanned) than actually occurred.

Lack of Management Commitment

Top management in many companies has not yet endorsed scan applications as being critical to the company. Unless this changes, it will be very difficult to implement scanner applications because:

- There will be a lack of financial and staff resources;
- There will be no strategic plan; and,
- There will be no support for the use of the application once it is created.

Possible solutions to these problems follow Table III-2.

Excessive Headquarters Focus

Many of the applications are managed and run at a chain's regional or headquarters offices. Yet, effectiveness calls for extensive involvement of operations and store level staff. Unless this occurs, implementation will be slow, stores will neglect data integrity, and applications will suffer.

Table III-1
SHARED APPLICATION SYSTEMS AND STAFFING

Application	Micro Computer at Store Level	UPC Data Base	Statistical Software and Modelling Expertise	Promotional Histories	Scanner Data Integrity	Merchandiser and Buyer Cooperation	Store Manager Cooperation
Shelf Management Systems	✧	✧				✧	✧
Computer-Assisted Ordering	✧	✧		✧	✧	✧	✧
Perishable Management System	✧	✧		✧	✧		✧
Direct Product Profitability		✧		✧			
Promotional Analysis		✧	✧	✧	✧	✧	
Display and Ad Analysis		✧	✧	✧	✧	✧	✧
Price Simulators		✧		✧	✧	✧	
Price Elasticity Models		✧	✧	✧	✧	✧	
Localized Marketing	✧	✧			✧	✧	✧
Basket Analysis		✧	✧	✧	✧	✧	
Direct Marketing		✧	✧	✧	✧	✧	

Staffing and Project Management

The various functions of these projects ideally require distinct staff capabilities. Table III-2 contains a list of the expertise required and the best sources for this talent. All of these resources probably will not be available in any chain or wholesaler, but the list of requirements can help highlight areas of need.

The table shows that some of the functions, such as database management and maintenance, require internal expertise. On the other hand, a food retailer does not typically employ statisticians. Thus, staffing should have an internal and external split. In general, on-going functions are best staffed internally, while those which requiring special expertise are better staffed externally.

Table III-2
SOURCES OF STAFFING FUNCTIONS

Function	Expertise	Primary Source of Personnel
Database Management and Maintenance	Knowledge of Database Management Systems and Experience in Quality Control	Internal Data Processing
Statistical Model Builder	Statistical Background and Experience in Retailing Applications	External Consultants
Microcomputer Interfaces	Knowledge of Microcomputers and Design of User Friendly Software	Internal Data Processing or External Consultants
Operations Applications	Knowledge of Applications and Computer Systems Expertise	External Consultants
Training	Knowledge of the Internal Organization and the Users Needs and Problems	Internal Data Processing Staff
Applications Manager Needs	Understanding of the Applications and Users' Merchandising	Internal Operations Staff

Project Management

The information systems function often is given this responsibility. This can be a mistake. In many retail operations, information systems is viewed as a service area and lacks the necessary stature to make the project succeed. In addition, while the staff understands some of the design issues, it typically lacks the perspective of the decision makers using the applications. Staff is put in the unenviable position of developing systems without really understanding user needs. The result can be disgruntled users and delayed projects due to unanticipated complications.

What can a retailer do to overcome this dilemma? One solution is to have a system designer with both computer skills and retail operations experience. This type of individual is ideal for the design phase but is difficult to find.

A second alternative might be to use outside professionals who have worked for other retailers. Under this approach, experience and knowledge of user needs is balanced against the cost and lack of internal control from using outsiders.

A third option is to assign the design task to a technically sophisticated user. While users are results-oriented, they must overcome a steep learning curve in designing systems. However, given enough time, the right individual can become highly proficient.

IV. CASE STUDY: HOW ONE CHAIN IMPLEMENTS SCAN APPLICATIONS

This section describes how a chain can implement scan applications. The case was developed as a composite of the experiences reported by the cross-section of retailers interviewed for this project.

OVERVIEW

XYZ Markets has 65 stores in a large midwestern city, with sales of approximately $700 million, and a leading 28% share of its market. Management is progressive but has moderate computer sophistication.

THE INITIAL PROPOSAL

XYZ started with relatively simple applications. By selecting easier applications first, costs would be lower and less data would be required. Management met and selected three applications:

1. Perishable Management Systems
2. Promotional Analysis
3. Space Management Systems

The first two applications were simple and low-cost. The third, the Space Management System, was chosen because it appeared to have a higher payout, and XYZ Markets management felt it was important to learn how to implement one complex application.

The plan was to install the applications sequentially, beginning with the Perishable Management System. (This system will be discussed for the case study only.) Selecting a project manager who would have final responsibility for the application was the first priority.

HIRING THE PROJECT MANAGER

Identifying a project manager was difficult. The CEO wanted someone who had an extensive data processing background and knowledgeable about food retailing. Management faced a dilemma. Should they select a data processing expert and hope he would learn enough about retailing or should they select an experienced food retailer and hope that individual would master data processing?

In making the decision, XYZ's management reviewed the role of the project manager. He would serve as the liaison among information systems, merchandising, marketing, and operations. While this was to be a staff function, the candidate had to have a "line manager's" mentality to get the job done. Management's fear was that slow progress would put the firm far behind its competition.

Eventually a district store manager who had been studying for an MBA and who had a strong analytical background was selected. To compensate for his lack of experience in information systems, a senior member of the Information Systems department was assigned to his team. This team was chartered to develop a "plan" and to begin implementing specific applications.

ACTION PLAN

Immediately after Fred Johnson, the new project manager, started he was asked for a detailed action plan for implementing the Perishable Management System. Fred knew that, while the company's produce departments were highly profitable relative to other departments in the store, they had lower sales and profit margins than competitors. This was one reason why management had given the system high priority.

Fred had never built a "systems" action plan before, so his information systems liaison provided much needed assistance. The plan contained the following elements:

1. Project Objectives and Payback
2. Needs Analysis
3. Output and Data Sources
4. Technical Requirements
5. Staffing
6. Time Schedule and Check Points
7. Implementation Plan
   a. Build
   b. Test
   c. Revise
   d. Accept
8. Estimated Costs

Under Project Objectives and Payback, Fred listed what the Perishable Management System was expected to generate in terms of increased sales, reduced spoilage and shrink, and gross margin. While difficult to estimate accurately, setting these financial objectives forced Fred to focus the project. This was critical to success.

Next, Fred's team reviewed the reports that would be generated by the system, the types of information needed for the application, and the best sources available for each type of information.

Fred used the Needs Analysis to identify the source of the department's problems. Through contacts in the field, he discovered that management had set an objective to always maintain full produce cases. This created serious shrink problems. In addition, the forecasts of daily demand were not very accurate. To forecast sales, managers used shipping reports which were distorted by the tendency to overstock, so errors were compounded. Clearly this situation could and should be corrected.

Next, Fred determined the Technical Requirements. The new system should be able to:

1. Improve the accuracy of item demand forecasts.
2. Determine the optimal ordering quantity based on the tradeoff between out-of-stock and shrink.
3. Produce "DPP" reports for the store manager and train him in their use.

Estimating daily item sales was the major challenge. The team contacted a consultant who had developed forecasts for a number of industries and asked for assistance. She proposed concentrating on 35 items which had the top 70% of departmental volume. A system covering all items would be much too costly and complex. Initially, the team had thought that full coverage was necessary, but quickly chose to focus on key items. System implementation would thereby be accelerated.

An item reordering system had to be devised. Through an outside vendor the team obtained a software package. An inexpensive microcomputer package was chosen over a mainframe version so that limited testing and experimentation could be carried out. Experience with the prototype system would guide subsequent modifications.

The next step was Implementation. Fred called an old friend, Allen Gray, who had worked for him in his old district. Allen was a progressive store manager who was willing to test new ideas, but was concerned that poor performance in the produce department would hurt his evaluation and compensation. The district manager assured Allen that his evaluation would not be adversely affected.

Having identified the key steps and issues, Fred prepared an Implementation Plan and Time Schedule. Because an outside consultant would help in developing the forecasting model, and a software package was acquired to determine item reorder policies, the time schedule of the project was actually faster than expected.

The implementation plan covered the following tasks:

1. Obtain scan data for the relevant produce items.
2. Improve the quality of the scan data.
3. Develop a forecasting model which included price of other items.
4. Determine out-of-stock and shrink costs.
5. Determine lead times for each item.
6. Integrate forecasts, costs, and lead times into the reorder model.
7. Test the model on past data to measure improvement over the current reorder system.
8. Modify the system.
9. Introduce the system in the test store.
10. Evaluate the system and modify it.
11. Produce a cost-benefit analysis of the application to determine whether all stores should implement the Produce Management System.

PROJECT EVALUATION

After the test of the Perishable Management System was completed, Fred analyzed all costs, problems, and changes needed in its design. He felt that the prototype test was very useful because it uncovered unexpected problems and kept the team from making major mistakes. The primary problem turned out to be the quality of the store level scan data. While all produce could be scanned, the checkers constantly entered the price. Item movement data was, therefore, very poor, making it difficult to accurately forecast and reorder. Fred designed a report which showed the checkers' produce scan rate. Management received weekly summaries, and within six weeks the data problems had been eliminated.

Fred also learned quickly that using available software and outside resources resulted in lower costs and faster implementation. While the chain had previously done everything in house, in this case it was more expedient to hire "experts" and adapt purchased software.

PROJECT ROLLOUT

Based on the prototype, Fred began to implement the application throughout the chain. Five stores were put on line. Item forecasting models were the major complication because each store needed its own version.

Managing the rollout required a special team to work with the store managers. The team prepared the managers for the implementation effort. The store and department managers were skeptical and gave many reasons why they did not need the system. To overcome these objections, Allen Gray testified that the system increased his produce department's profit 27%. A store manager's compensation would thus increase $2,300 per year. Suddenly, the doubters became interested in trying the new system.

V. THE RETAILER OF THE FUTURE

This section describes how scanning and related technology can ultimately be combined to improve overall performance. The year is 1995, and the setting is the headquarters of a progressive food distributor.

MERCHANDISERS

Ralph Williams is a category manager who has just sat down at his voice activated computer terminal, with his Decision Support System (DSS) on the screen. He uses his "mouse" to select the desired reports. Available to Ralph are his trade deal system, price elasticity models, DPP for the categories he manages, and a store movement analysis system.

At 11:00 A.M. Ralph will attend a meeting to discuss the weekly promotional plan. In preparation, he selects the trade promotions system which can review last week's trade promotions in his categories. Data are transmitted by the manufacturers through E-Mail (Electronic Mail). Ralph remembers when manufacturers sent salespeople to headquarters to discuss the "new program" and wonders how he could have done his analysis while spending so much time meeting with sales representatives.

Ralph presses a button to list all trade promotions. He has sorted them by item volume so that deals offered on the highest volume products are displayed first. He deftly moves the mouse around and selects 35 promotions for more detailed analysis. He also wants a forecast of sales, optimal deal discount, forward buy, and whether the item should be displayed or advertised. Ralph can override sales estimates if he feels that they are too extreme. He can also alter any of the variables.

Ralph then calls up the forward buying program and studies how much profit can be made from items on deal. Two fast-moving items offer excellent trade deals, and he selects these items for promotion. The system sends a message to the warehouse indicating the items to forward buy.

Once the promotional plan is finished, Ralph turns to his store movement reports. Gone are the days when he managed the category by market and zones. A report comes on the screen listing slow-movers by store. He sends a list of these items through E-Mail to each store manager and suggests that they remove these items from their stores. They can respond on their terminals by simply indicating which items they would like to continue selling.

A DPP report is also produced for each item, by store. Ralph notices some high-volume items with low DPP and asks the system to detail the cost, space, inventory, and selling price. He calls up the items in the category and studies the relative prices and margins, noticing a high volume item is selling at an unusually low price compared to the other items. He raises the price, and the screen indicates how the unit volume and category profits change. Satisfied with this move, Ralph hits a key, and the price changes are transmitted to electronic shelf tag markers for instantaneous adjustment in all stores.

It is almost 11:00 A.M. and Ralph places the promotion recommendations in his brief case and heads to the meeting. He thinks about the stores he will visit later. Before computer automation, he spent much of his time preparing analyses and meeting with manufacturers' salespeople. Now, he uses these visits with store and district managers to discuss local marketing and merchandising problems. He checks for needed changes and scouts the competition to see what merchandising and product ideas he may want to copy. Ralph wonders how the job could have been done without a computer but chuckles, remembering people used to think two-dimensional television was great.

STORE MANAGER

Lynn Chaney is sitting in the back of the store at Main and Division. Her computer terminal is on and she is looking at a weekly sales and DPP report by product category. The report shows items which either are not moving as rapidly as the category managers desire or that have low DPP. Two years before becoming a store manager, she spent one month at the new FMI training facility learning how to use DPP data.

She looks at several low DPP items, concerned that deleting them may damage the variety image she is trying to project in her upscale, young, urban market. She was chosen as store manager for this particular store because her demographic profile is similar to the market's customers. To identify the consumers involved, she pulls up a screen indicating the demographics of each item's buyers and concludes that all but one product should be deleted, since they are targeted to an older, lower socio-economic group. However, she notices that one item that should appeal to her market is doing poorly.

Lynn goes onto the selling floor to investigate. She notices the item is placed in a specialty section of limited interest to the target market. She creates a computer note to move the item, hopefully improving its DPP.

Next, Lynn uses the space management package which she runs monthly. The scan data and item forecasts have been updated and the items' seasonality index entered. Headquarters downloads this information to the store manager for the end of the month reset. Regularly resetting the store has increased unit sales dramatically and has proven to be well worth the extra effort. Many items have seasonal sales, so space is reallocated depending upon the sales changes. The space management system is also run just before holidays to allocate adequate space to seasonal items.

Next, the computer-assisted ordering system is run and the weekly order communicated to the distribution center. The system automatically adjusts for the shelf space changes that Lynn has made. Lynn heads for lunch with Ralph Williams to discuss the latest merchandising ideas she has for his categories.

ADVERTISING MANAGER

Rebecca Donelson is preparing the weekly ad. She is sitting at a computer work station with a cursor overlayed on a digitized table. As she draws an item, the cursor passes over a UPC code and then enters the number into the system. Once the ad is drawn, the computer system indicates the projected increase in unit sales based on copy space and promotional discount.

She calls up a computer program that automatically allocates space to maximize net profit from advertised items. Price discounts come from the category manager's computer systems, and ad size is based on the optimal use of the pages. She does not like the layout's appearance, so she overrides the program. The new profit estimate is unchanged so Rebecca chooses the revised layout.

Next, she begins working on the chain's direct marketing program. By tracking individual customer purchases, the system can send promotions to those customers most likely to respond. A couple in their 70's get coupons for a well-established, high-fiber cereal. Single males are sent coupons for a six pack of a new beer produced by a local micro brewer. Families with two teenage children receive coupons on staples such as soft drinks, milk, ice cream (bulk pack) and acne remedies.

To analyze consumer response, Rebecca reviews the individual customer's purchase records to check coupon redemption and likely additional purchases. It would appear that the program is working based on customer cross-buying patterns.

She decides to meet with her advertising agency which is proposing a new promotional device. It goes directly into a household's computer, displaying promotions on the screen using new graphics packages with high resolution images. This new technology will enable the chain to directly transmit promotions designed for each customer.

SHELF MANAGEMENT SYSTEMS

OBJECTIVE

Shelf management systems are designed to determine and evaluate space allocations for items within a category. They strive to improve profit by focusing on out-of-stock costs, restocking costs, number of facings, and location on the shelf.

DESCRIPTION

The advantage of shelf management systems is that they can rapidly calculate space allocations for many items. Thus, a given area of the store can be analyzed by the system and a new planogram produced quickly.

Another use of shelf management systems is to adjust category space allocations storewide. Some systems will allocate more space to categories that have higher profit per square foot holding fixed some cost constraints. The major challenge is determining which items can be deleted from a category without adversely affecting category volume.

EXAMPLE

Suppose there were three items in a category with the following weekly volumes: item 1 = 36 units, item 2 = 72 units and item 3 = 12 units. Each comes in a case of 24 and the shelf holds 18 units per facing. The store receives two shipments per week.

For item 2, it is essential to stock more than one case at a time because weekly movement is three cases. If only one case is placed on the shelf, then frequent out-of-stocks will occur, particularly during periods of heavy business on the weekends. In addition, the operator would prefer not to keep extra stock in the back room. So, for item 2 he must be able to stock two cases at a time. If three facings are allocated to item 2, then only 3 x 18 = 54 units can be on the shelf. Only after the shelf is down to six units can the two cases be loaded on the shelf. Therefore, to meet store requirements four facings are probably necessary.

For item 3 which sells only twelve units per week or one case every two weeks, one facing seems appropriate. However, given the pack size, two facings will be required to load a full case on the shelf. Finally, for item 1 which sells thirty-six units per week, three facings are necessary. If two facings are used, then there is a significant chance of out-of-stock.

Thus, for this category the final shelf set is three facings for item 1, four facings for item 2, and two facings for item 3. The driving factors were unit movement, pack size, out of stock requirements, and the desire for no backroom inventory. If different rules were applied, another shelf set would result. The automated shelf management systems also take the information just described and other parameters, such as gross margin, to compute the profitability of different shelf sets.

IDEAS ON IMPLEMENTATION

A key to implementing these systems is to involve the store manager and merchandisers in their use. To increase such involvement, one chain uses the shelf management systems to produce price books. This encourages the store managers and merchandisers to become familiar with the output and ultimately more interested in other applications.

NOTE OF CAUTION

Shelf management systems should help to fine-tune the space in a category. However, these systems must be used carefully because there is little information available on how sales of items will change with alternative space allocations. Suppose an item selling twelve units per week is given twice the space. Will it sell two times as much or will it sell only twelve units? It is very difficult to answer this question without testing.

COMPUTER-ASSISTED ORDERING

OBJECTIVE

A Computer-Assisted Ordering (CAO) system creates accurate orders, at the proper time, for efficient delivery to each store and uses data from store-level scanning systems to control replenishment.

DESCRIPTION

While there are several types of CAO systems, an automated reordering system typically contains these elements:

1. Shelf Allocation System. A CAO system normally operates along with an effective space management system. Automated reordering is based on the number of cases that can be stocked. This is established by the space management system.
2. The system also needs accurate unit movement records. Without this precision, it is impossible to estimate on-hand inventory and proper order quantities. Therefore, a highly disciplined scanning operation is an important prerequisite.
3. Finally, the system needs accurate demand by item, including estimates of seasonal fluctuations.

The steps in using a CAO are straightforward, but system maintenance requires a high degree of ordering discipline. The system is driven by a simple inventory model which generates item reorder points. When the inventory on the shelf falls below the reorder point, an order is placed. Lead times from the warehouse or DSD vendor determine when the order needs to be placed. To operate effectively, the system must:

1. Establish the optimal reorder point, i.e., number of units on hand when an order is triggered.
2. Develop a sales forecast for each item which indicates daily unit movement.
3. Compute the shelf allocation for the item (in number of units). This input comes from the Shelf Management System.
4. Track the number of units sold from store scan data.
5. Determine when to reorder. This is triggered when the estimated on-hand inventory is less than the reorder point.
6. Place an order. This is automatically produced by the system when estimated on-hand inventory is below the reorder point.

The benefits of a CAO system are:

1. Ordering is consistent regardless of personnel sickness, transfers, vacations, etc.
2. Stores are freed from errors associated with manual ordering.
3. Sales increase because the out-of-stocks are reduced.
4. Store appearance is more consistent.
5. Inventory levels drop and turns increase.
6. Less backroom stock is needed since a higher percentage of the shipment goes on the shelf.

EXAMPLE

Suppose an item comes in a case pack of 24. The store receives daily deliveries and it takes three days to receive a shipment from the warehouse. Demand by day of the week is:

Day	Demand in units
Monday	2
Tuesday	2
Wednesday	4
Thursday	6
Friday	8
Saturday	10
Sunday	4

If inventory at the beginning of Monday is twelve, then a re-order is made because by the time it arrives on Thursday morning, only four units will be on the shelf.

Assume the case arrives and demand matches the numbers in the table above. Then, on Wednesday another order is placed to arrive on Saturday morning so that if demand is higher than expected, the item will not be out-of-stock.

The example helps to show that delivery times, demand estimation, and demand variability are critical in using the system.

IDEAS ON IMPLEMENTATION

CAO is a difficult system to implement. A retailer should begin with only a few categories within a store rather than attempting to implement it for all categories. The application can then be expanded to other categories and departments. To make the system work, store personnel must be trained and involved in its use.

NOTE OF CAUTION

The primary challenge with CAO is the need for on-going discipline. If the information is not carefully recorded and the shelf set maintained, inaccurate reorder points and quantities will occur. Out-of stocks and large backroom inventory will result. Only a highly disciplined retailer can use this system in its current design.

Another major issue is new product introductions. When new products are introduced, the sales for other items in the category are affected. Since it is difficult to estimate the effect these new items will have before they are introduced, it may be necessary to adjust category demand during the initial weeks after the product is introduced.

PERISHABLE MANAGEMENT SYSTEM

OBJECTIVE

This system helps the perishable departments better manage ordering, inventory and shrink. It tracks purchases and item movement and then identifies items with high spoilage and shrinkage.

DESCRIPTION

The system matches receipts and sales and can be used in several ways, including:

1. Revealing discrepancies between the quantities delivered and the items sold moving through the front end.
2. Identifying items with the greatest shrink.
3. Helping to identify the cause of the problems.
4. Showing products that are close substitutes so that when an item goes on sale, smaller quantities of its counterparts can be ordered.

EXAMPLE

A retailer implementing this application might take the following steps:

1. Select high-volume items covering 65-70% of the total perishables department sales.
2. Assign a UPC and apply the symbols to all items covered by the system.
3. Determine item movement.
4. Track all item shipments into the store.
5. Use the item movement and shipment data to compute the on-going store inventory as well as shrink.
6. Report the volume, shrink, and profitability of each item. Draw conclusions about the ratio of inventory to profit, spoilage to unit movement, etc.
7. Recommend changes in buying, merchandising, and pricing practices.

Companies using a Perishable Management System report that they have realized substantial savings. For example, one retailer improved profitability by 1.5% of produce sales. Another retailer used this type of system to adjust orders. This cut spoilage in half and increased profits by 2.5% of produce sales.

IDEAS ON IMPLEMENTATION

Care and planning in two areas can facilitate implementation. It is important to accurately record all shipments into the store. By using microcomputers with descriptions of items previously entered into the system, it is easier for store personnel to accurately identify and enter the shipment data. The easier the data entry, the more cost-effective the system.

The calculation of movement can also be tricky since scan systems typically only record total sales, not the pounds or pieces. This means that there is an on-going need to translate sales and

price into quantity, weight, or volume. Programming this information into the system makes the process work more smoothly.

NOTE OF CAUTION

The major challenge in this application involves translating dollars recorded at the checkout stand into units. Unless this information is accurate, the system loses its value. Using computerized scales to enter weight directly into the database increases system accuracy.

DIRECT PRODUCT PROFITABILITY

OBJECTIVE

DPP is a retail cost accounting system designed to evaluate the profit contribution of an item. Retailers can use DPP to determine which items to stock, to help set pricing, and to influence shelf position.

DESCRIPTION

The basic concept is to use more than simple gross margin and turns to determine an item's profitability. Space, inventory carrying costs, and stocking costs should be added to the cost of an item. Bulky or higher priced items are more costly to handle than smaller, inexpensive items. DPP provides a more accurate measure of profitability for each item.

By reviewing DPP periodically, the store manager can refine the store's merchandising mix. In fact, if the retailer's operations staff is provided with regular DPP reports, the product mix within the store can be varied according to trends and seasonal changes.

As DPP systems are automated, store managers will be able to use them as an on-going management tool. However, before this can happen, perpetual inventory, gross margin data, accurate item movement data, and automated planograms are necessary. Thus, it appears that these other applications should precede store-level DPP.

EXAMPLE

An example of using DPP is to divide the items into several groups. The top group is "Pure Gold" and the bottom group is "Pure Lead." The Pure Lead group may look like the items in the table below.

PURE LEAD

	DPP/ Unit	Units/ Week
Brand A Rice (5 lbs)	<$1.45>	1
Private Label Spaghetti	<$0.95>	1
Brand B Mandarin Oranges	<$0.71>	1
Brand C Cereal	<$0.29>	1

These are clearly items that can be deleted from the store without any real risk of losing customers.

Another use is to evaluate "like" items to see which can be deleted. Below an example is given for Devil's Food Cake Mix.

DEVIL'S FOOD CAKE MIX

	DPP/ Unit	Units/ Week	DPP/$/ Week
Brand A	.01	12	$.12
Private Label	<.01>	3	<.03>
Brand B	<.01>	7	<.07>
Brand C	<.01>	8	<.08>

The category may be far more profitable with only two brands. Brand B or C is a candidate for removal along with the private label brand.

These examples highlight the potential for the use of DPP. Its application requires more than simple facts about a category. Merchandisers need to change policies.

IDEAS ON IMPLEMENTATION

The key to successful implementation of DPP is to develop a system that regularly provides up-to-date DPP results as a routine part of the reporting cycle. If DPP is done only on an ad hoc basis, it is likely that more pressing demands will cause

many companies to divert time and energy from the activity. This will, in turn, ultimately reduce the benefits of DPP.

NOTE OF CAUTION

The major caution with DPP echoes the concerns described earlier about space management: namely, the difficulty of predicting the impact of certain changes on profitability because there is no clear indication of how they will affect customer purchasing behavior. For example, it is impossible to know what will happen to the DPP of a profitable item if it is given additional facings, i.e., will it increase or simply remain unchanged?

PROMOTIONAL ANALYSIS

OBJECTIVE

Scanner data are used to analyze the effectiveness and profitability of promotions. Relevant questions include:

1. Which items are most profitable to promote?
2. Given specific trade promotions, what is the optimal deal discount and display activity?
3. How much product should be bought to ensure adequate in-store inventories?

DESCRIPTION

Promotional analysis can be conducted at many different levels ranging from simple before-after analyses to the use of statistical models. In analyzing promotions, software can also be designed to assist key management functions from merchandising to advertising and buying.

Steps in this analysis include:

1. Collect promotional histories including:
   a. Promotional discounts.
   b. Size of advertising features.
   c. Display activity (weekly).
2. Collect sales histories.
   a. For each UPC in the product category.
   b. Before, during, and after the promotion.
3. Develop an estimate of the sales that would have occurred if a promotion had not been run. This can be accomplished by using a simple trend analysis comparing sales in pre-promotion weeks or by using statistical models. The models can more accurately estimate trends and predict non-promoted sales.
4. Compute the promotion's profitability. The profits if no promotion had occurred are compared to profits when the promotion is run. Decreased sales from other items in the product's category and the cost of display space and advertising should also be included in the analysis.

EXAMPLE

The following table gives an example of a promotional simulator based on a statistical model developed from scan data. The simulator allows the merchandiser to compare alternative promotional discounts to see which maximizes profits.

The results show that for this item, passing on the trade promotion discount penny-for-penny does not pay out. The optimal deal price is substantially lower than this discount. At this point, it is necessary to raise another question: Did this promotion attract more customers? Unfortunately, item level scan data cannot answer this question.

DEAL DISCOUNT PROFIT AND SALES COMPUTATION

Regular Price:	85 cents
Regular Cost:	71 cents
Discount Cost:	59 cents

PROFITS IN DOLLARS
Deal Discount

Brand	0%	10%	20%	30%	9.41 Cents Optimal
Brand A	*238*	*427*	*362*	*31*	*442*
Brand B	190	182	173	162	183
Brand C	693	681	668	649	682
Brand D	444	427	409	384	429
Brand E	317	312	307	299	313
Brand F	1280	1241	1199	1138	1245
Brand G	266	257	247	234	258
Brand H	147	145	144	143	146
Total	**3575**	**3672**	**3509**	**3040**	**3698**

IDEAS ON IMPLEMENTATION

Since promotions have a significant impact on overall performance, any improvement in profitability based on promotional analysis will benefit the organization. Training is critical for the merchandiser/buyers in their use. It is important that the models are considered to be an aid and not a substitute for managerial judgment.

NOTE OF CAUTION

The major problem with the models and analysis of promotions is that they cannot analyze the effect of a promotion on store traffic. In most cases, a given item on promotion will not increase store traffic; but, the entire bundle of items promoted certainly does cause customers to shop at a specific store. This means that care must be taken in using these models because recommendations could lead to more profitable ads but less store traffic.

DISPLAY AND AD ANALYSIS

OBJECTIVE

Display and Ad Analysis is a "before-after" system which estimates the effect of either a display or an advertisement.

DESCRIPTION

The analysis begins by determining the "baseline" sales for an item; that is, average sales per week for several weeks before the advertisement or display occurs. Then, the sales during the display or advertisement period are recorded. Actual sales are then compared to the baseline. The effect of the advertisement or display is the increase in sales above the baseline.

EXAMPLE

Suppose an item receives a "C" ad in the newspaper and is offered at regular price. Baseline sales during the four weeks prior to the advertisement were 150 units per week. During the advertising week, sales were 250 units. The effect of the advertisement was 250/150 = 1.67 or a 67% increase in sales. The cost of the ad was $100, and the gross margin for the product was 25%. The 100 unit increase in sales contributed an additional $25 in profits. If the retailer received a co-op allowance of $50, then running the ad resulted in a net loss of $25 because sales did not increase enough to overcome the net cost of the advertisement.

IDEAS ON IMPLEMENTATION

The major problem in implementing this analysis is collecting all of the necessary data. For example, display data are difficult because not all stores run the same displays and many do not maintain detailed records of what is on display. To overcome this problem, it is important to monitor the weekly display activity in a select set of stores. The stores should be selected at random each week. The reason is that store managers may follow different programs if they are measured.

NOTE OF CAUTION

When a price reduction accompanies a newspaper advertisement, it is very difficult to estimate the effect of the advertisement alone. Usually the retailer can only analyze the total promotional event. In contrast, when a display or advertisement is run with no price change, its unique effects can be determined.

Another potential problem can occur when the baseline analysis is distorted by abnormally high or low sales just before the event. When this occurs, the effect of the display or the advertisement will be misjudged. For this reason statistical models, which can adjust for abnormal prior events, are used in the more advanced applications.

PRICE SIMULATORS

OBJECTIVE

Setting price is a critical retail issue. To be effective, a system must track competitive price, movement, margins, and total category profit. Price simulators are designed to enable retailers to evaluate the financial impact of different pricing strategies.

DESCRIPTION

A simulator is simply a spreadsheet which computes the profits, margins, and item movement when the price of an item is changed. Some systems also display competitors' prices and item movements. More sophisticated simulators incorporate price elasticities into the movement estimates.

EXAMPLE

This example shows how a price simulator can be used by a retailer to set the price of a margarine item. Brand description, price, cost, gross margin, and item movement are shown on the screen.

SCREEN 1

Description	Price	Cost	Gross Margin	Item Movement	Profit
Brand 1	.73	.61	.12	936	$112.32
Brand 2	.73	.61	.12	438	52.56
Brand 3	.84	.66	.18	136	24.48
Brand 4	.77	.61	.15	246	36.90
Brand 5	.49	.33	.16	1145	183.20
Total					$409.46

The user proceeds to the next screen to look in more detail at a single item.

Suppose the simulator is used to evaluate Brand 1. The second screen indicates which competitors promoted this brand last week and the promotional prices. Screen 3 displays item movement and price as well as retail cost and profit for the last five weeks. This helps the manager to decide how to change the price.

SCREEN 2

ITEM: Brand 1 WEEK: 1/29

Competitor	Price	Is Product Promoted?
Chain 1	.73	No
Chain 2	.75	No
Chain 3	.71	No
Chain 4	.65	No
Chain 5	.59	Yes

SCREEN 3

ITEM: Brand 1

Week	Weekly Movement	Price	Cost	Gross Margin	Profit
1/1	735	.73	.61	.12	$ 88.20
1/8	2135	.59	.53	.06	128.10
1/15	438	.73	.61	.12	52.56
1/22	645	.73	.61	.12	77.40
1/29	620	.75	.61	.14	86.80

The manager can use the detailed screens to understand the item's competitive position and see how price changes affect sales. For example, on 1/29 the price for brand 1 rose from $0.73 to $0.75. Profits increased and sales decreased slightly. Thus, the price increase was effective.

IDEAS ON IMPLEMENTATION

As with the promotional analysis, it is important to use accurate data. Since price can vary by zone or region, the simulator should be designed to analyze zones or regions separately. This requires price checks of competition by zone or region. Accurate historical pricing files make this analysis far easier to manage because the historical pricing policies of competitors can be analyzed and understood.

NOTE OF CAUTION

There are two major problems in using price simulators:

1. Accuracy of movement estimates – Most retailers using a pricing simulator simply require the user to estimate item movement. A more accurate approach is needed.
2. Price image – It is often possible to raise the price for an item without significantly decreasing sales. However, price image may be affected, and simulators do not take this factor into account. This means that the overall price image projected by the store could become negative if the retailer makes all pricing decisions based only on information provided by the price simulator.

PRICE ELASTICITY MODELS

OBJECTIVE

Price elasticities can be crucial in determining an item's shelf price. Price elasticity indicates how much an item's sales decline (increase) as the price increases (decreases). Items with higher elasticity lose sales more rapidly for a given price increase than those with lower elasticity. Price elasticities suggest to the retailer which items should have price increases and decreases.

DESCRIPTION

Scan data allows the retailer to compute the price elasticities for the items in a category. A statistical model can be built which correlates changes in regular retail price with changes in sales. The model then predicts the changes in sales that will occur as a result of a specific change in price.

EXAMPLE

Here is an example of how to compute and use price elasticity.

Week	Price	Sales
1	1.19	80
2	1.19	75
3	1.19	85
4	1.19	90
5	1.19	70
6	1.09	110
7	1.09	100
8	1.09	103
9	1.09	112
10	1.09	100

The table shows prices and quantities for a ten-week period. The average sales over the first five weeks were 80 units at $1.19. For the last five weeks, it was 105 units at $1.09. The price elasticity is the percentage change in the quantity sold compared to the percentage change in the price.

For this example, the percentage change in quantity sold is [105 – 80/80] = .3125 and the percentage change in price is [1.19 – 1.09/1.09] = .0840. The price elasticity is the ratio of these two numbers, i.e., .3125/.0840 = 3.72. The higher the elasticity, the more responsive sales are to a price change.

It is useful to understand how the sales response to price can be used to evaluate the profitability of alternative prices. For the example, suppose the item cost $.90. Using the average units sold, the profit at $1.19 is 80 x [1.19 – .90] = $23.20 and the profit at $1.09 is 105 x [1.09 – .90] = $19.95. Thus, it is not as profitable to lower the price. The optimal price can be determined from the elasticities.

IDEAS ON IMPLEMENTATION

The above example illustrates that price elasticities are complex to estimate. Statistical models are required. Therefore, it is important that great care be taken in computing elasticities so that optimal price can be accurately determined.

NOTE OF CAUTION

The risk in using price elasticities is that the elasticities may suggest higher prices than the firm currently charges. The result of implementing these prices may be lost traffic. Therefore, selected categories should be tested to determine the long term effect.

LOCALIZED MARKETING

OBJECTIVE

Most retailers are aware that their sales mix varies by store. Therefore, if each store is merchandised to reflect this variation, overall shelf space, DPP, and inventory turns will increase. To do this the retailer must design a "local" marketing strategy.

DESCRIPTION

The necessary tools for this application are shelf management systems and specific displays and flyers designed for each store. A successful strategy will lead to store-by-store merchandising and increased store manager discretion.

EXAMPLE

Suppose store 1 has an upscale, young, single customer base and store 2 has a family oriented, middle income customer base. Then the following differences will be observed.

- Profit in certain product categories will vary significantly.
- Price elasticities (price sensitivity) will be higher in the middle income, family oriented store.
- The mix of items in specialty departments (delicatessen, bakery, etc.) should be different.

Recognizing these changes should lead to targeted merchandising and pricing to each market segment.

IDEAS ON IMPLEMENTATION

To execute local marketing, merchandisers and store personnel must be trained to understand scan reports. Simultaneously, stores can be reset using the Shelf Management System. Seasonal variation, new products, and trends can all mean that regular resets will increase profitability.

NOTE OF CAUTION

The key is to provide scan data to area merchandisers and store managers for accurate reports and analyses. The retailer must develop a disciplined system for store managers to implement the local strategy. After training store managers, the retailer can exploit local market differences and still enjoy economies of scale.

BASKET ANALYSIS

OBJECTIVE

Basket analysis helps the retailer understand purchasing behavior. This knowledge can be used in a number of ways:

1. Evaluating the profitability of different customer segments.
2. Analyzing the purchasing patterns related to specific promotional items. This can show the extent of cross buying (e.g., pasta and tomato paste) and the overall profitability of dealing.
3. Comparing the types of items purchased across stores to fine tune merchandising by store.
4. Designing special promotions to attract customers based on their individual purchase patterns.

DESCRIPTION

To develop a basket analysis system requires the following steps:

1. Design or acquire software which records individual household purchases for each shopper in the store.
2. Design or acquire reporting and analysis software to evaluate the information received from the customer purchase panel.

To do "Basket Analysis" only requires tracking purchases on a given shopping trip. Cards are not needed for this application, only software to identify all transactions for each customer at the check out counter. However, tracking individual household purchases across time enhances the data.

EXAMPLE

Suppose a sale is offered on a soft drink. What is the profile of customers buying this product and what other types of items do they purchase?

The "Basket Analysis" shows that the buyers spent on average $47 on their basket on that trip to the store. Other items with a high purchase index for these customers are: peanut butter, pasta products, and household cleaning products. Low index items are specialty dinners, frozen chili, and specialty ice cream.

Based on this information, the retailer can determine the profitability of this customer. Then, the retailer can design promotions to attract these customers. The retailer can also design promotions which are not likely to be of interest to them (such as specialty ice cream) so as to broaden the customer base.

IDEAS ON IMPLEMENTATION

To implement this application requires creating reports to merchandisers and advertising staff which explain the cross-buying of the products.

Frequent shopper programs are one way to gain customer cooperation. By participating, the customer receives discounts, coupons, premiums, or other incentives.

Some of the reports to management include:

- Value of a customer
- Customer Segment
- Cross-buying
- Shopping frequency
- Purchase frequency for advertised and non-advertised items.

NOTE OF CAUTION

Cross-buying patterns do not identify causal factors. Therefore, it is important not to draw wide ranging conclusions from these data.

DIRECT MARKETING

OBJECTIVE

Direct marketing involves the design of special promotions based on the likelihood of customer response. A database and statistical model are used to determine the probability of purchase. If a retailer keeps detailed information about a customer, then the likelihood of response can be used to design targeted promotions.

DESCRIPTION

Retailers can analyze the customer's likelihood of purchasing certain products and estimate the market potential given the customer's demographics. Direct marketers have used these tools for years. However, a grocery retailer collects far more transactions per week, so maintaining the database is a major task.

EXAMPLE

Suppose the Smith household, with a husband and wife in their late 30's with two teenage boys, buys milk, soft drinks, and snacks, at rates well above average. In addition, they also buy specialty products such as Chinese foods. The retailer can promote to this household with special coupons for these items and individually tailored flyers to increase the odds of attracting them to the store. In effect, the retailer develops a specific program for each customer.

The retailer can also assess the sales "potential" by household and then compute the share of the potential achieved. For example, through survey research, it is determined that households with two adults and two teenagers spend $180 per week on grocery store purchases. The retailer notices that the Smiths spend $60 per week in his store. Assuming that $180 is the potential,

the retailer's share of the potential is 60/180 or 33%. By designing special promotions for this household, the chain can increase its share. More importantly, it can offer different promotions to the low versus high share customers. For example, high share buyers receive a quantity discount through a frequent purchaser program, while the low share purchaser receives promotions on specific items.

IDEAS ON IMPLEMENTATION

Similar to customer panels and basket analysis, the key to this application is the customer database. This database is created through the use of a special card that the customer is given which offers certain unique services. The scanner tracks all customer purchases when the card is presented at the checkout counter. It works like a frequent flyer program with the retailer capturing purchase history by customer.

NOTE OF CAUTION

The database generated is very large. The problem becomes: How can all this information be maintained and used? This question is still not easily answered.

Appendix B: ADDITIONAL SCAN APPLICATIONS

ELECTRONIC SHELF TAGS

The technology has recently been introduced to permit electronic shelf tags. The system is interactive at store level. While the primary purpose of the system is to control prices and make price changes easily, the system can also be tied into scanner data.

For example, by maintaining item movement as well as price on the shelf tag, store ordering is simplified. If an item is moving slowly, a flag will indicate a potential problem. The store manager can then check area stores to determine possible causes. If necessary, prices can be changed almost instantaneously.

COMPUTER-ASSISTED ADVERTISING LAYOUT

Using computer-aided design technology with statistical models which estimate the effects of advertisements, it is possible to automate the layout of advertising pages. The concept is relatively straight-forward but somewhat difficult to execute.

First, models are built to estimate the effects of different sizes and types of advertisements. Incorporating differences across categories and deal levels, the models indicate the sales increase generated by each item in the advertisement. Costs for the space and gross margins for the products are also entered into the system. Finally, using item movement, the expected profit from advertising different items is computed.

A computer-aided design program is used to create a layout. Variations in the size of the advertisement and deal discounts for each item are considered. Sales and profits are calculated for each alternative to determine the "optimal" layout. No retailer is currently using this application, but the technology exists to develop this system.

COMPUTER-ASSISTED DISPLAY ALLOCATIONS

Decisions on display allocation should be impacted by the return on space, but with so many alternatives, calculating the return is difficult. A retailer faced with this problem can use a system to compute the return for each display and select the best items to display.

With scanner data, a statistical model can determine the impact of display of items in different categories. Using this model, the optimal allocation of display space can be determined.

To illustrate the process, suppose a retailer has certain display requirements, including: (1) category was not displayed last week, (2) sales are above minimum weekly movement level and (3) the item is in the weekly advertisement. One hundred items qualify under these guidelines. Next, the model calculates sales and profit for each item by type of display, including the labor to install and tear down the display. In addition, item movement is used to determine the duration of the display given its size and estimated item demand. All possible items are then evaluated. The merchandiser specifies the desired mix of categories. The program then determines the optimal display mix.

Advantages of the program are: (1) it can systematically analyze far more displays than a merchandiser can, and (2) decisions on the types of items to promote are based on profitability.

AUTOMATED COUPON DISPENSERS

These systems automatically dispense coupons to customers when they purchase selected items. For example, the system could be used to provide customers who purchase commercial sweet goods with a coupon for in-store bakery products. Consumers like: 1) receiving an additional benefit from shopping at their favorite store, 2) the incentive to try new featured items, and 3) the typically higher average monetary value of these coupons compared to those in newspapers or FSI's.

Retailer benefits include both offering a customer a service that frequently is not available at other stores in the market and the ability to selectively influence shopping behavior through use of coupon incentives.

As a sample application, suppose the chain targets new mothers as good, long term customer prospects. Then, it can issue coupons redeemable only at a particular store on disposable diapers, baby food, and other items. The key is to identify heavily purchased items and then offer coupons for these products. Since the consumer is usually more price-sensitive to those items, redemption should be much higher and store response would be influenced.

Appendix C: STUDY METHODOLOGY

The study involved the following steps:

1. Industry Interviews. The primary source of information was personal interviews with key retailing executives (both food and non-food), industry consultants, and data and software suppliers. Appendix D lists those companies willing to be identified.

2. Literature Review. A review of key industry publications such as *Progressive Grocer, Supermarket News, Chain Store Age,* FMI reports, academic journals, and industry studies was conducted to find published examples of data applications.

3. Evaluation of the most significant applications in the development of supporting analysis.

4. Evaluation of the Report by the Coca-Cola Retailing Research Council. To ensure accuracy and to evaluate the conclusions of the study, the Coca-Cola Retailing Research Council reviewed an earlier version of this report. This review identified critical issues and made the report more relevant to retailers and wholesalers. The committee also identified ways to implement report recommendations.

Appendix D: STUDY PARTICIPANTS

Kurt Salmon Associates
Price Waterhouse
Hanes
Milliken & Company
Vanity Fair
Blue Bell
West Point Pepperell
Levi Strauss
Haggar Company
Strawbridge & Clothier
Belk Brothers
K & G Retail
Bullock's
Target Stores
Gold Circle
Makro
Marshall Field's
K-Mart
NCR Corporation
Catalina Marketing
Telepanel
Logistics Data
Super Valu Stores
Hannaford Bros.
Smith's Management
Lucky Stores
Star Markets
Price Chopper
Grand Union Company
Wakefern Corporation
H.E. Butt
Randall's
Ralph's
Datachecker
Safeway