The Revolutionary and Evolutionary Universal Product Code:

The Intangible Benefits*

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Background

The development of Universal Product Bar Codes (UPCs) is perhaps the most important innovation to the retail food industry since the implementation of shopping carts. Technological advances in retail food stores, with the exception of refrigeration innovations, were virtually nonexistent until the 1970s. At present, there exists a gradual but nonetheless continual shift on the part of retail food stores from conventional checkout systems to scanning checkout systems. Since the inception of scanning by the Kroger Company in Cincinnati in July 1972, roughly 1/3 to 2/5 of the 20,000 supermarkets in the United States have converted to scanning (Eveleth).

In the past several years, much attention has been given to scanning systems. To illustrate, the theme of the 22nd Annual Meeting of the Food Distribution Research Society in Orlando, Florida was "The Food Industry in An Electronic Age"; the 1984 Food Marketing Institute (FMI) Convention in Dallas, Texas, featured at least three scanning workshops, and in October of 1984, the National Grocers Association (NGA) sponsored a scanning conference in New Orleans. Further, since 1982, in the Journal of Food Distribution Research, eight articles have dealt with scanning issues (Fletcher, Trieb, and Edwards; Johnson; Lucas; Jourdan; Cohen; Canavan; Trieb and Fletcher; Stoll).

The Universal Product Code is unquestionably the major factor behind the participation of the food industry in the electronic age. Because of the adaptation to computerization in the food industry and subsequently because of quantum leaps in data availability to food retailers, the Universal Product Code is justifiably a revolutionary device.

This paper concerns primarily the evolution of the benefits of scanner-derived information from UPCs. The first thorough study of the benefits of scanning ever made available for general industry use was commissioned by the NGA in 1983. Benefits are of two types--hard or tangible benefits and soft or intangible benefits.

Although formal definitions are lacking, hard benefits refer to savings from improvements in speed and accuracy due to the shift from conventional checkout systems to scanning systems. Examples of such tangible benefits include: (1) improvements in checkout productivity (in terms of either items checked per labor hour expended, customers handled per hour, or labor cost per item),

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(2) reductions in shrinkage, (3) reductions in store bookkeeping (balancing of cash registers, accumulation of total sales, sales by department and sales tax collected), (4) reductions in item price marking, (5) reductions in labor for item price changes, and (6) improvements in produce margins due to more accurate weighing. On the other hand, soft benefits relate to savings from improvements in managerial decision-making due to the shift from conventional checkout systems to scanning systems. Obviously hard benefits are easier to measure than soft benefits. Nevertheless, soft benefits are real benefits.

Initially, primarily in the 1970s, the justification of scanner installations was solely attributable to the hard benefits. However, food retailers have almost unanimously felt that "in the long run, the intangible benefits of scanning will outweigh the tangible benefits" (NGA). In the 1980s, food retailers have begun to explore the soft benefits of scanning systems. While there has been little disagreement concerning the existence of soft benefits, the realization of these benefits is unequivocally in the embryonic stage of development. Consequently, emphasis in this paper is on the intangible benefits of scanning.

The Intangible Benefits to Management

With the introduction of scanning checkout systems, tremendous possibilities exist for the generation of data and the use of such data in the development of programs for all levels of managerial decision-making (department level, store level, supervisory level, and senior management level). Scanning checkout systems have come about within such a short time span, and the technology has been changing so rapidly and constantly that resources (money, time, and energy) have in general only been devoted to systems analysis, installation, basic operations training, and basic record keeping. Conceivably the hardware and software needed to generate data valuable for management decision-making are available, and retail food distribution organizations have the capability to generate such data. To date, however, it appears that relatively few resources have been devoted to generating and/or organizing scanner data to be used as tools for major managerial decision-making. Consequently, it is very likely that data presently being generated are being underutilized in managerial decision-making. To substantiate this point, several food industry consultants claim that less than ten percent of supermarket companies with scanning systems are making use of the data for decision-making purposes (personal communication).

Further, little thought has been given to data collection and presentation in terms of which managerial staff members need the information, what needs the various staff members have, and in what form the staff members require the information. Different levels of management are likely to have different needs for information relative to type, complexity, and time span.

Over the last several years, attention has been focused on exploring ways to utilize scanner data for both operational and merchandising decisions. Wide speculation exists about the benefits from scanning systems. Using detailed sales data for UPC coded items, as well as information in displays and feature ads, it is possible to pinpoint the effect of changes in shelf sets, to measure the impact of new product introductions, and to evaluate promotional effectiveness. Industry realization of scanning benefits thus far has been limited primarily to operational areas via improved checker productivity and faster checkout, greater price accuracy, more efficient labor scheduling, and elimination of individual item price-marking. Although savings generated through improvements in these areas have generally been substantial, many industry observers believe that even greater savings will accrue to the retailer that fully utilizes scanner data for more informed decision-making (General Foods Corporation).

Specific examples of intangible benefits to management include the following (Ricker, p. 27; NGA, pp. 9-10):

(1) Improvements in shelf space allocation: Sales and gross margin volume per item can be compared with the amount of shelf space allocated.

(2) Improvements in labor (predominantly front-end) scheduling: Accurate sales

data and customer counts by register, store, time of day, and day of week over a period of time would help in labor scheduling. Determination of peak periods and customer shopping patterns.

(3) Improvements in loss (shrinkage) control: Computer can be programmed to provide periodic reports on shrinkage rates by item or section.

(4) Improvements in consigned goods identification: A clear identification of all consigned merchandise sold at the store will improve management control.

(5) Improvements in new item evaluation: Obtain quick accurate assessment of new item performance.

(6) Improvements in out-of-stock position: Improved product inventory control procedures should help reduce out-of-stocks.

(7) Improvements in advertising and promotion results: Evaluate the impact of price specials and special displays immediately and more accurately.

(8) Improvements in pricing decisions: Impact of price change readily available.

(9) Improvements in product mix selection: Product movement data, dollar sales, and margins will help determine the optimum assortment of merchandise needed. Use of exception reports.

(10) Improvements in profitability analysis: A department's contribution to the firm's overhead can be readily calculated.

(11) Improvements in customer relations: Descriptive receipt tape, increases in checkout accuracy, and increases in speed of checkout.

(12) Improvements in store security: Ability to monitor checkers either on store terminals while processing transactions, or by use of statistical analysis of refunds granted, coupons accepted, over-rings, etc. Item purchases can be compared to item sales to determine whether there is a noteworthy quantity of any item purchased but not sold. If there are large discrepancies, perhaps items brought into the store as inventory are not being sold but are disappearing through some form of theft or pilferage.

(13) Design of fresh meat, poultry, and seafood system: Use of variable weight UPC symbols which provide detailed sales and margin data on meat, poultry, and seafood operations.

(14) Design of produce control system: Ability to control produce sales, spoilage, and margins.

(15) Other uses: Monitor bad check information, automatic reordering, perpetual inventory, calculation of store gross profits by department and by commodity class. Once item purchase (through direct store delivery) and sales data are available, perpetual inventories of items carried at the store level can be maintained. Automatic reorders are based on preparing orders from item sales movement.

Despite this lengthy list of intangible benefits, the most important benefit well could be the development of an information system designed to meet the needs of the total firm and also sub-segments. Typically a multiple-store retailer will initially use scanner data in support of headquarters-level merchandising decisions: applications such as new item tracking, advertisement markdown reports, and testing merchandising concepts. At the store level, scanner data are typically used to fine tune the product assortment and shelf set to match the unique sales pattern in each store.

The ScanLab Project: The Prototype

The ScanLab project, initiated in 1981, represents perhaps the most comprehensive and authoritative study to date on the practical use of scanner data to improve merchandising decisions. This prototypic project involves the joint efforts of Dick's Supermarkets of Platteville, Wisconsin and the General Foods Corporation. The purpose of

the ScanLab project is twofold: (1) to accelerate retailer progress in the use of scanner data for merchandising decisions, and (2) to provide retailers with practical steps to allow them to move toward more effective use of scanner data.

The ScanLab system captures actual weekly sales and profit performance primarily via several reports. The reports serve as diagnostic tools in the analysis of product distribution, shelf space allocation, new item tracking, seasonality, item movement, retail sales dollars, gross profit dollars, and return on inventory invested. Trend reports permit the tracking of data over time in order to view performance differences on a week-by-week basis. In sum, the ScanLab project has been instrumental in obtaining some of the soft merchandising benefits from scanning systems.

Barriers to Realization of Intangible Benefits for Management

A tremendous reservoir of potential still remains for realizing the intangible benefits of scanning. Potential contributions are only starting to be tapped. Soft benefits have been identified, but now they need to be extracted. Despite the existence of various firms using scanner-derived information in decision-making, the use of this information in managerial decision-making has been generally regarded as difficult to accomplish (Rogers). One of the major barriers has been the problem of building software to process the scanner data into useful forms. In addition, the resources and expertise needed to organize and analyze the scanner data are not available in-house. Third, because of problems of data integrity in the scanner file and too much detail in "data overload," some retailers doubt the value of scanner data in decision-making. Changes in item UPC, size, case pack, and description requires computer file maintenance procedures. Also, the data base should include information on factors which may influence item performance: out of stocks/no distribution, shelf inventory levels, type of merchandising activity, pricing errors, and allowances from manufacturers. On the issue of "data overload," to quote Joseph R. Hyde, III:

> We can bury ourselves alive in statistics if we don't watch out. We must concentrate on determining the critical data to run the business. Where can the greatest payoff come? We must concentrate on that question because we have access to more data than we can comprehend.

Finally, a noteworthy barrier to realizing intangible benefits has been the failure of food retailers in general to recognize the competitive opportunity.

The Intangible Benefits to Research

The soft benefits of scanner data also spill over to the research arena. There exists a wealth of information for special purposes and studies. For example, scanner-derived information may be used to investigate shopping patterns of households--by store brands, generics, or national brands.

The availability of daily sales volume and pricing information collected by scanning checkout systems has almost unlimited potential application in economic research and management decision-making. It has only been since 1979 that scanner data, through refinements by the manufacturers of scanning checkout systems, combined with the improved understanding of these sophisticated systems by retail users, have been generated with enough reliability and consistency for application in economic research (Jourdan). Importantly, there has been only limited use of scanner data as a basis for demand analyses. With the exception of the work by Jourdan, no analyses of consumer demand have been conducted using scanner data.

The lack of published research is not surprising since results tend to be firm specific and firms regard data and results as proprietary information. Published studies of weekly retail food store sales tend to focus on sales of individual items or product lines. The various studies center attention on in-store pricing experiments (Doyle and Gidengil), the effects of promotional programs on individual items (Hoofnagle; Curhan 1974), the measurement of price elasticities (Funk, Meilke, and Huff; Marion and Walker), the

results of space allocation and display (Cox; Curhan, 1973; Chevalier), and the effects of interactions among short-run strategy variables such as advertising, space allocation, and pricing (Curhan, 1974; Wilkinson, Mason, and Paksoy).

Traditional analysis of consumer demand has generally been dependent upon aggregate annual, quarterly, or monthly time-series data of consumer purchases and prices. These data do not always represent current market conditions and typically are too general for product specific decision-making. Consumer panels and consumer surveys provide more detailed data for specific products but are expensive methods of data collection. Scanner data, on the other hand, rely on the collection of actual customer purchases at specific prices by scanning checkout systems in retail food stores.

The use of scanner data permits the estimation of short-run own-price and cross-price elasticities of demand for various food commodities. Estimation of demand elasticities for individual retail items can be extremely useful for decision-makers. Retailers, by knowing the own-price and cross-price elasticities associated with various commodities, obtain a clear picture of how price changes affect product sales. Knowledge of the respective elasticity measures aids retailers in predicting the effects of price changes and price sensitivity for specific products, and therefore could lead to more effective marketing strategies for individual retail firms.

Information services based on scanner data, not necessarily inexpensive, are available from several firms (BEHAVIORSCAN, MARKETRAX, NABSCAN, Nielson, and SAMI). Such services are described in Table 1. Scanner data are primary data and have properties similar to cross-sectional and time-series data. The observations may be made over time while also being made with various food stores. Consequently, the scanner data base is extremely flexible and can accommodate varied economic investigations. However, two considerations are in order in conjunction with the acquisition and organization of scanner data. The vastness of scanner data is realized by the fact that close to 20,000 items are currently available in retail food stores (Gowens). In addition, the scanner data for the multitude of products is available on a daily basis. Though much empirical work and theoretical work exists with respect to demand analyses in recent years, reliable estimates of demand parameters for disaggregate food and nonfood commodities are few in number. Scanner data may result in the most detailed and definitive source of retail food industry statistics available to researchers.

Concluding Remarks

The acceptance and application of sophisticated, technical equipment by the retail food industry must be combined with decision-making models which utilize the data potential of these systems. Historically, retail food store management personnel have been reluctant and skeptical to adopt formal decision-making models. Most food retailers have not exploited the potential intangible benefits available from scanners. Instead and rightly so, they have been involved with the operational aspects of scanners and with the support activities. Realization of all of the potential intangible benefits has been reserved for later phases of scanner system implementation. Now, however, the time has come for food retailers to seriously explore the intangible benefits from scanning in order to maintain their competitive edge. This paper centers on the potential for retail food stores to use scanner data to assist them in short-term and long-term managerial decision-making. The data collected via scanning systems has great potential application in management decision-making and economic research.

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Table 1

Description of Information Services Using Scanner-Derived Data

BEHAVIORSCAN:	Operated by Information Resources, Inc. (IRI). A panel research technique. Information comes from two panels of 2,500 households each in Pittsfield, Massachusetts, and Marion, Indiana, and two scanner-equipped store panels. IRI collects daily data and can run advertising tests since both markets have cable TV.
NABSCAN:	Operated by the Newspaper Advertising Bureau, the acronym stands for "National Advertised Brands Scanning Reports." Weekly information is gathered from 264 scanner-equipped stores--including A&P, Alpha Beta, Public Markets, Grand Union, Jewel, Kroger, Weingarten, and Winn-Dixie. Retailers get monthly reports on brand movement and promotions in their stores compared to the national sample. When data are sold to national advertisers, the income is split between NABSCAN and the retailers.
Nielsen, A.C.:	Operates SCANTRACK and SCANTEST. SCANTRACK is used to track new product introductions, line extensions, make price evaluations and analyze consumer and trade promotions. SCANTEST links scanner-equipped stores to a household panel, whose key demographics are known. Among the tests carried out are shelf allocation, price testing, impact of sales prices, advertising influences, off-shelf displays, space management programs, and the impact of consumer promotions.
SAMI:	Operated by TIME, Inc. A 14-store panel of scanner-equipped supermarkets in Portland, Maine, which is linked to a demographically defined consumer panel. Consumers are selected by intercept interviews, given questionnaires and a special I.D. card. The research group draws data from other markets as well.
MARKETRAX:	Operated by Management Science Associates. Combines scanner data with household purchasing information to study repeat buying, light-to-heavy using areas, brand switching and general demographics.

SOURCE: "Scanning and Market Research: Long Promised, Now a Reality," Supermarket Business, February 1981.

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