ECONOMIC EVALUATION OF SCANNING

by

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Nearly 90% of the retail operators attending a 1982 NARGUS management development and operations workshop held at the University of Missouri, Columbia, Missouri, stated that they would be using scanning systems in their stores in three years. This informal poll supports an earlier NARGUS survey made in 1979 when 75% of the respondents agreed that supermarket operators without scanning would be at a significant disadvantage in five years.[1] That survey also revealed that 99% agreed that information available from scanning would help the independent retailer to manage his store more effectively... those attending the Missouri workshop were in agreement.

One food industry researcher states, "Independents could find themselves playing catch-up in a merchandising game they thought they dominated."[2] Knowledge of customers, their service and product needs plus merchandising flexibility have been the strenghts of the independent food retailer. Today, however, it is a new competitive environment with the computer/scanning systems providing information to supermarket executives that will enable them to analyze the purchase patterns of an individual store's customers so that product selection, prices and promotional programs, as well as new store location and development decisions, can be tailored to customer needs rather than standardized on a regional or area basis.

Purpose

While the percentage of supermarket stores scanning is increasing, the growth rate is declining (Table 1). For the 1974-1983 time period, the growth rate was 117%. Since 1980, the growth rate was 28%. For 1981-83, the rate dropped to 15% and for 1983, it is 14%. While these latter rates are still impressive, they do

TABLE 1. PERCENTAGE OF SUPERMARKET STORES SCANNING

Year	Percent
1974	< .1
1975	.1
1976	.3
1977	.7
1978	1.7
1979	4.4
1980	8.9
1981	17.1*
1982	19.9
1983	22.5

*A 18% decrease in store numbers in that year due to redefining a supermarket as one with $2 million annual sales.

illustrate the point that the growth in scanning may be leveling off which could imply a saturation level which in fact is not the case.

Of the approximately 23% of supermarket stores scanning, the vast majority are chains or independents with at least $100,000 weekly sales. The conventional wisdom of the industry was that a retailer needed at least $100,000 weekly volume to justify scanning. This rule was based on studies (e.g., UCLA, USDA and McKinsey and Co.) completed in the early 1970s. Current new technology has reduced computer cost even further and has made it feasible for lower volume operations to cost-justify scanning installation. The mid and low sales volume independents lack the information and personnel to analyze the feasibility of scanning. Thus, this study was initiated to evaluate scanning in order to determine the feasibility of scanning systems for mid and low sales volume supermarkets (i.e., independents with less than $100,000 weekly sales).

The objectives of the study were as follows:

1. To determine the advantages and cost justification of scanner-equipped customer transaction systems in selected mid and low sales volume food stores.

2. To determine the breakeven sales volume necessary to cost-justify alternative scanning systems such as stand-alone, on-site computer, and off-premise host computer systems.

3. To investigate the potential options and cost-benefits for management decision making through scanner-generated information.

4. Evaluate alternative systems and make recommendations for improving retail food store checkout/scanning computer systems.

The first two objectives are the primary ones in the study and presented in this paper. That is, to verify the cost and savings associated with scanning and to determine the feasibility.

The research methodology included on-site studies of selected firms and interviews with equipment manufacturers. Many food retailing firms were visited in order to collect cost and savings data due to scanning, in addition to observing their operations. Equipment manufacturers were visited to become familiar with the specifications, features, capabilities, and costs. No two pieces of equipment had identical features and capabilities.

Equipment Costs

Initially, the only available scanning system was driven by a backroom computer. The system's minimum cost was in the $150,000-$200,000 range. Such a system was prohibitive for a small independent retailer. But, just as in the case of the mainframe computer, there has been an evolution in scanning systems. Stand-alone scanning systems have been developed. While their capabilities have increased, the cost has declined. In the past year, a new generation of scanning equipment has been introduced with significant cost reductions. Currently, an independent retailer with a five lane store could install scanning for $75,000. This cost is a significant reduction over previous estimates. The installation cost includes the hardware, some basic software, front-end scales, meat scales and UPC labeler, checkstands and some remodeling.

Savings Estimates

The annual savings estimates used by the industry are given in Table 2.[3] The estimates are categorized into front-end productivity, checkout accuracy, accounting and administrations, and item price removal. Front-end productivity and item price removal are the two major contributors to scanning savings.

TABLE 2. INDUSTRY AND STUDY'S ANNUAL SAVINGS ESTIMATES

Category	Percent of Sales	
	Industry	Study
Front-end productivity	.62 - 1.15	
Checkout accuracy	.19 - .63	
Accounting and administration	.1 - .38	
Item price removal	.23 - .67	
TOTAL	1.14 - 2.83	1.0 - 2.0

The annual savings estimates determined in this study are also shown in Table 2. Estimates for individual categories were not included since the study firms do not maintain detailed information for such calculations. For example, they record total labor dollars and not labor hours. However, the firms were able to provide a total annual savings estimate. The estimates were in the 1.0% - 2.0% of sales range which are typically quoted in the industry. This implies that savings as a percent of sales has not changed over time.

These sayings estimates are only hard savings.[4] Soft savings are yet to be realized even though the principle benefits of scanning lies in better utilization of the data generated.[5] A food industry consultant has stated that less than 10% of supermarket companies with scanning are making comprehensive use of scan data for decision making purposes. Most of the use of scan data has been of an ad hoc nature. One attempt to use scan data in an organized decision making framework is Scanlab.[6] The question that arises is why isn't the industry using more scan data? The reasons vary but may be summarized as follows: (1) difficult to quantify, (2) data accuracies and overload, (3) resistance to change, and (4) failure to recognize the competitive opportunity.

Feasibility

The most common method of determining the attractiveness of an investment is the payback period method. This method looks at the number of years required to recoup the original investment. The payback period is determined by summing the savings flow over the number of years needed to equal the initial outlay of cash. The results of the simple payback period method for a $75,000 investment is given in Table 3 for levels of savings and six levels of annual supermarket sales under $5 million. Using the conservative estimate of 1% savings, the results imply that a supermarket with $2 million annual sales could recover the initial investment cost is 3.75 years. Thus, given today's scanning technology and a 1% savings rate, every supermarket could justify scanning on hard savings alone.

While the simple payback method is easy to calculate, there are two conceptual problems. First, the total savings before taxes is used as the comparative value, and second, this method does not account for any unevenness in the stream of savings. Comparing the before tax savings and the costs disregards several crucial factors. Among these are income taxes on savings, investment tax credit and recognizing depreciation as a non-cash cost. A much more equitable method of generating the comparative value would be the net after tax cash flow. The calculated net after tax cash flow determines the net amount of cash available because of the initial capital investment. This method looks at all the critical factors previously mentioned.

In order to overcome the problem of analyzing the unevenness of the flow of savings, the net present value concept is employed. Using this method, the after tax flow for each year is discounted. The discount factor could equal inflation or

TABLE 3. SIMPLE VERSUS ECONOMIC PAYBACK EVALUATION ($75,000 INVESTMENT)

Annual Sales	Percent Savings					
	1%		1.5%		2%	
	Simple	Economic	Simple	Economic	Simple	Economic
$ million	---------- years ----------					
4.5	1.67	2.35	1.11	1.53	0.83	1.13
4.0	1.88	2.68	1.25	1.73	0.94	1.28
3.5	2.14	3.10	1.43	1.98	1.07	1.47
3.0	2.50	3.71	1.67	2.35	1.25	1.73
2.5	3.00	4.60	2.00	2.87	1.50	2.09
2.0	3.75	5.00	2.50	3.71	1.88	2.68

any required rate of return. This stream of discounted savings is then compared to the initial cost of the system. If over a three year period the discounted savings total exceeds the original cost, then the system has paid for itself in less than three years. If the stream of discounted savings is less than the initial outlay of cash, then the opposite is true.

The following example, Table 4, shows the net present value concept using the discounted net after tax cash flow as the comparative value for a $2.5 million annual volume supermarket which used internal cash to install scanning and a 1% savings estimate. The current value of the stream of cash over the five years is actually $79,861 when the $104,064 is reverted into today's dollars using a discount rate of 10 percent per year. Since the cost of the project was $75,000, the rate of return on scanning would be more than 10 percent.

A comparable set of values to the simple payback method was computed using the net present value concept (Table 3). The economic payback period is longer for every sales volume and savings estimate when compared to the simple payback periods. Based on the economic payback evaluation and using the conservative 1% savings estimate, supermarkets with $2 million and $2.5 million sales may not find it feasible to scan. This is based on an industry custom of five years as the maximum payback period.

Conclusions

Based on a $75,000 investment for a five lane supermarket to scan, the economic payback evaluation procedure implies that an annual sales volume of $3 million would be sufficient without consideration of soft benefits to recover the initial investment cost in less than four years. This sales volume translates into approximately $57,000 per week. Yet, one does not observe supermarkets in this size category or even slightly larger ones implementing scanning.[7] Why? Some of the reasons might be summarized as lack of information and comfortable with current situation. Also, in every industry there are a few early adopters and a large number of "wait and see" operators. Scanning appears to be at the "wait and see" stage and can expect a new surge of implementation as new generations of user-friendly hardware and software are developed.

Scanning introduces a major element of change into the retail store. Introducing new technology is never easy. Even after employees and customers become accustomed to the scanning system, their reactions and attitudes should continue to be monitored. The successful operation of a scanning system requires constant attention and discipline even after the newness wears off.

TABLE 4. ECONOMIC EVALUATION WORKSHEET ($2,500,000 ANNUAL SALES AND 1% SAVINGS)

	Year 1	2	3	5	6
			- dollars -		
Annual savings	25,000	25,000	25,000	25,000	25,000
- Annual expenses	4,000	4,000	4,000	4,000	4,000
= Before tax cash flow	21,000	21,000	21,000	21,000	21,000
- Depreciation	10,688	15,675	14,963	14,963	14,963
- Interest on debt	--	--	--	--	--
= Taxable income	10,312	5,325	6,037	6,037	6,037
- Taxes at 25%	2,578	1,331	1,510	1,510	1,510
+ Investment tax credit	7,500	0	0	0	0
= Net income	15,234	3,994	4,527	4,527	4,527
+ Depreciation	10,688	15,675	14,963	14,963	14,963
= After tax cash flow	25,922	19,669	19,490	19,490	19,490
- Debt principal payment	--	--	--	--	--
= Net after tax cash flow	25,922	19,669	19,490	19,490	19,490
Discount factor at 10%	.919	.826	.751	.683	.621
Discounted value (annual)	23,563	16,246	14,637	13,312	12,103
Discounted value (cumulative)	23,563	39,809	54,446	67,758	79,961
Total initial investment	75,000				
Total discounted value	79,861				

Payback = 4.60 years

One last point is that wholesaler support (i.e., hosting) appears to be an impediment to the mid and low sales volume supermarkets to scan. Without this service, scanning for the smaller stores will be minimal. Furthermore, capturing the vast potential of the soft benefits will be out of reach for the smaller supermarkets without wholesalers support. Thus, as stated in the introduction, these stores without support will be operating at a significant disadvantage.

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ENDNOTES

[1]Survey Results of the NARGUS Computer Application Council Member Survey, November, 1979.

[2]Grinnell, Gerald. ERS, USDA. The Continuing Struggle Between Supermarket Chains and Independents.

[3]The estimates are drawn from commonly referenced studies such as UCLA, USDA, McKinsey and Co., Giant Food, Weingarten's and IBM.

[4]Hard savings are those that result from improved speed and accuracy from the scanner's ability to identify a Universal Product Code symbol and to retrieve the produce price from a computer file. Examples of hard savings include: improved checker productivity, greater checker accuracy, improved accounting methods and item price removal.

[5]Soft savings relate more to improved management information and control, and generally accrue over time as a result of using scanner-generated information that is processed through a computer. Examples of soft savings are: better labor scheduling, improved checker evaluation, effective direct store delivery control, improved shelf allocation, automatic reordering, and more effective merchandising.

[6]Scanlab is a project being conducted by General Foods, Dick's Supermarkets in Wisconsin and Willard Bishop Consulting Economists, Ltd.

[7]There are a few in the U.S. in this category that are scanning, but they are unique.

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