FOOD RETAILERS' PERCEPTIONS OF SUPERMARKET UPC SCANNER CHECKOUT SYSTEMS

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Abstract

This paper reports preliminary findings about food retailers' perceptions of a wide range of characteristics about the Universal Product Code scanner checkout system. Food retailers comprised of two sampling frames, namely, installers and non-installers of the scanner checkout systems. Food retailers from thirty-six states responded to the mail survey. Their perceptions are anlayzed and compared.

Introduction

The evolutionary changes in the food retail enterprises, leading to the present day electronic retailing have not always been unpredictable (McNair and May 1978). However, the introduction of the Universal Product Code (UPC) scanner checkout system in supermarkets in 1974 was particularly significant. It marked the successful culmination of two major events: (1) the acceptance of the now familiar UPC symbol as the common labeling code by the grocery industry, and (2) the invention of the UPC readable electronic scanner checkout system. Briefly, the UPC scanner checkout innovation was expected to offer the retail grocery industry a means to offset its spiralling operating costs via improvement in front-end productivity (Danzansky 1975), and increases in productivity of marketing decisions via utilization of UPC scanner generated sales intelligence data (Hutt 1979). Also, food retailers anticipated increase sales through enhanced consumer satisfaction in the entire range of general services such as quicker checkouts, detailed and descriptive sales receipt, lower misrings, among other benefits (Adamy 1975; Shaw 1977).

The focus of published studies by marketing researchers has been on supermarket shoppers' reaction to the scanner checkouts, and on the item price removal controversy. McGinnis and Gardener (1976), Mason (1979), Robinson and Langrehr (1980), and Pommer, Berkowitz, and Walton (1980) are some of the early investigators who assessed consumer reactions to the innovation. Overall, these studies reported consumer satisfaction with the scanner checkouts. Hutt, Harrell, and Allen (1976), and Harris and Mills (1980) concentrated on item removal controversy and its societal implications. Their findings, while not conclusive, indicated the need for retention of price markings in the UPC scanner checkout systems to prevent debilitating consumers' abilities concerning price awareness, price determination, and price consciousness.

In addition to the above references from the academia, popular trade journals such as Progressive Grocer, Chain Store Age, among others, have and continue to provide updates on this technological innovation in the supermarket in every issue. While the focus of academe and trade publications has been on consumer reaction to scanner checkouts, little attention has focused on retail food managements' reaction to this innovation. Just as questions about the advantages and disadvantages of the scanners for the consumers have been considered, the questions need to be asked of grocery retail managements. Therefore, the present investigation was undertaken.

The purpose of the present paper is (1) to provide a parsimonious description of the food retailers' perceptions of the potential costs, benefits, and problems surrounding the UPC scanner checkout system; and (2) to determine the extent of differences in perceptions of the system characteristics between food retailers who have installed the system and those retailers who have not installed the system in their supermarkets. It must be noted that the findings reported in this paper are only preliminary, exploratory, and primarily descriptive in nature. Future papers will present both the conceptual development and hypotheses within an innovation adoption-diffusion framework.

Research Methodology

Data Base

The data base for the investigation comprised of all food retailers in the United States. Two sampling frames were involved: (1) food retailers who had installed the UPC scanner checkout system as of June 1980, and (2) food retailers who had not installed the system. The first sampling frame comprised 215 food retailing firms. This list was compiled from updates published by the Food Marketing Institute. The second sampling frame of non-installers comprised 240 food retailing firms randomly selected from a list generated from the 1980 Chain Store Guide.

To identify management personnel closely associated with the UPC scanner checkout system, and to seek the firm's cooperation in the study, all firms within both sampling frames were mailed participation forms. Completed participation forms were received from 169 (78.6%) firms in the first sampling frame, and 148 (61.7%) firms in the second sampling frame.

The survey questionnaires were mailed directly to all management personnel identified in the participation forms. Survey were mailed to 310 individuals within 169 firms in the first frame, and to 261 individuals within 148 firms in the second frame. Four weeks after the first mailing, one follow-up mailing was undertaken. A combination of methods was employed to reduce the likelihood of low response rate (Kanuk and Berenson 1975). Briefly, these included a strategically written cover letter, prepaid return envelope, assurance on anonymity, and a

renewed offer for a complimentary copy of the summary of survey results for participation. A total of 150 (48.4%) questionnaries from 122 (72.2%) firms were received in the first frame; and a total of 104 (39.9%) questionnaires from 89 (60.1%) firms were received in the second sampling frame. The relatively high response rates in terms of participating firms, though unexpected, suggested the food retailers' interest in the UPC scanner checkouts.

Research Instrument

Structured mail questionnaires were employed in the study. Five-point Likert rating scales with possible response ranging from "strongly agree" to "strongly disagree" were utilized to scale items measuring various dimensions of the scanner checkout system.

A pool of UPC scanner specific scale items were developed after an extensive review of published literature (Flint 1975; Hutt 1979; Phase I Report of McKinsey and Company 1971; Evaluation Manual for Electronic Checkout System by Arthur Andersen and Company 1971; Shaw 1977). From the pool of operational items, sixty items were selected for inclusion in the questionnaire.

Analysis

The frequency counts of the food retailers' responses are examined across all items. Next, responses of installers and non-installers are pooled and factor analyzed using varimax rotation. The extracted factors are labeled and alpha coefficient of reliability computed (Cronbach 1951). Using the labeled categories, the differences in perceptions of the UPC scanner checkout characteristics between the installers and non-installers is examined by t-tests. Finally, a two-group linear discriminant analysis is performed to examine if factored items discriminate installers and non-installers.

Results and Discussion

In this section the descriptive results of the preliminary analyses of the food retailers' perceptions are presented. The discussion is limited to general observations with emphasis on comparative differences in perceptions among the installers and non-installers of the innovation.

General Characteristics of the Samples

In the first sample food retailing firms from 36 states responded, while in the second sample firms from 34 states responded to the survey. Differences in the type of ownership of the firms, and firm size (number of full-time employees and annual dollar sales) were statistically significant ($p<.05$) in the two samples. In general, larger firms have installed scanners while smaller firms tend not to opt for scanner checkouts. While differences between firm-characteristics in the two samples are significant, differences in respondent-characteristics in terms of age, education levels, position within the firm, number of years experience are not significant ($p>.05$).

Retailers Perceptions of UPC Scanner Checkouts

From an examination of food retailers' responses to the sixty items concerning the UPC scanner checkout system, the following observations are made:

* The majority of installers and non-installers perceive the costs associated with the scanning system to be high. Also, installers perceive the cost of financing to be higher than that perceived by non-installers.

* Installers and non-installers both recognize the tangible and intangible benefits accruing from the system. However, installers differ from non-installers in their perceptions of benefits accruing from eliminating item price marking; efficiency of customer credit check; savings in inventory carrying costs; and the potential revenue generated from the sale of patronage checkout data.

* A large majority of installers than non-installers perceive shoppers to be satisfied with the speed of checkout, checkout-register tape, and with the accuracy of the scanner system to weigh and price purchased items.

* Retailers perceived the scanning system to be reliable, compatible, and the stored data to be useful for estimating overall profitability. However, the majority of food retailers perceive the system to have non-scan, information retrieval, and in-store symbol marking problems.

* Installers and non-installers perceive some difficulty in hiring skilled technicians for operations, but do not foresee cutbacks in the total number of employees due to increases in labor productivity.

* Installers and non-installers agree on the need to educate shoppers on scanner checkouts; disagree that item price removal makes shoppers less price conscious; and are equally split on the possibility of consumers being charged higher prices than shelf-marked prices.

* The majority of installers and non-installers perceive the opportune time to install scanners is when opening a new store, and not when replacing outdated checkout equipment. Both groups perceive the system to be inflexible towards partial conversion of checkouts.

* Both groups are neutral in their response for the desirability of financing by such alternatives as bank, hire-purchasing, pilot leasing, and internal funding. However, fewer installers than non-installers agree about willingness of financial institutions to readily loan them the capital requirements for the system.

* Installers perceive published guides, scanner publications of the Supermarket Institute, and trade shows and conventions to be useful sources of information. Non-installers exhibited similar response trends on information sources.

* Installers and non-installers perceive that by

supporting management decision favoring scanner checkouts, neither the firm nor their personal position within the firm would be jeopardized.

Factor Analysis, Reliability, t-Tests, and Discriminant Analysis

Factor Analysis

To summarize and reduce the dimensionality of the sixty-item responses into meaningful categories, factor analysis was undertaken. The resulting principal component factor analysis with varimax rotation yielded twenty-one factors with eigenvalues of greater than one. The extracted factors have been labeled while taking into consideration all factor loadings of 0.30 or more. These factor results, reliability coefficients, and t-test results are summarized in Table 1.

The extracted factors account for 65.78 percent of the total variation in the retailers' perceptions of the scanner checkout characteristics. It is interesting to note that scanner benefits and shopper satisfaction are major factors extracted. This is indicative of food retailers' desire to increase operational productivity while maintaining competitive edge through shopper satisfaction. These factors have often been cited as the major decision influencers towards adoption of this innovation (U.S. Senate Committee on Commerce 1975).

Reliability

The reliability coefficients for each identified category of multi-item scales is obtained by Cronback's alpha. As shown in Table 1, the reliability coefficients range from several scales are below acceptable level, but

TABLE 1

SUMMARY OF RESULTS OF FACTOR ANALYSIS, RELIABILITY ALPHA, T-TESTS, AND DISCRIMINANT ANALYSIS

Factor No.	Factor label	No. of items	Variance Explained eigenvalue value	%	Reliability alpha	t-value
1.	Scanner checkout benefits	6	5.62	(9.37)	0.6745	-2.67 **
2.	Scanner information benefits	4	3.24	(5.41)	0.6877	1.93 *
3.	Shopper satisfaction	7	3.09	(5.14)	0.6606	-6.39 ***
4.	Management perceived risk	4	2.29	(3.82)	0.6522	0.89
5.	Internal financing views	2	2.22	(3.71)	0.7738	1.22
6.	System operational costs	4	2.03	(3.38)	0.5184	-1.70
7.	Scanner equipment costs	2	1.91	(3.18)	0.6990	2.23 *
8.	Adoption decision influencers	3	1.80	(3.00)	0.4833	1.74
9.	Competitive influences	2	1.77	(2.95)	0.3648	2.73 **
10.	Skilled personnel requirement	2	1.66	(2.77)	0.3916	0.23
11.	Additional management effort	3	1.53	(2.55)	0.3611	0.31
12.	Feasibility of partial conv.	2	1.49	(2.48)	0.5291	0.85
13.	Additional scanner benefits	3	1.43	(2.39)	0.3831	1.90
14.	Addtln. adoption consideration	3	1.31	(2.19)	0.4093	-3.57 ***
15.	Item price legislation	1	1.28	(2.14)	--	-0.35
16.	Scanner purchase options	2	1.23	(2.04)	0.4209	1.38
17.	Scanner operational costs	4	1.19	(1.98)	0.4664	-1.22
18.	Scanner adoption timing	2	1.15	(1.91)	0.4282	-1.84
19.	Order-installation timelag	1	1.11	(1.85)	--	-1.97 *
20.	Labor productivity	2	1.06	(1.77)	0.1382	0.15
21.	Pricing ethics	1	1.05	(1.75)	--	0.70
	Total	60	39.46	(65.78)		

*p<.05 **p<.01 ***p<.001

DISCRIMINANT ANALYSIS

	Number / Percentage	CLASSIFIED: Installers	Non-installers	
ACTUAL	Installers	106 87.6%	15 12.4%	121 100%
	Non-installers	26 29.2%	63 79.8%	89 100%
	Percent correctly classified: 80.4%			

in this initial analysis no corrective measures were undertaken.

t-Tests: To determine statistical differences in perceptions among installers and non-installers, item responses within the factor-categories were summed and t-tests applied on each of the twenty-one-category mean scores of the two independent samples. A summary of t-test results is presented in Table 1. Installers and non-installers differ significantly on seven of the twenty-one categories. Based on sample means, installers perceive scanner benefits, shopper satisfaction, additional adoption considerations, and order-installation timelag more favorably than non-installers. Likewise, non-installers perceive scanner generated information benefits, scanner equipment costs, and competitive influences more favorably than installers.

Discriminant Analysis

Finally, to determine if the twenty-one categories of UPC scanner checkout characteristics could discriminate installers and non-installers, two-group linear discriminant analysis was undertaken. Based on the classification criterion developed by utilizing within-group covariance matrices, the percentage of food retailers correctly classified into installers and non-installers is 80.5 percent. These classification results are presented in Table 1. The results, however, must be viewed with caution since no effort was made to adjust for the upward bias resulting from classifying the same individuals used to calculate the discriminant function.

Conclusions

This initial analysis documents for the first time food retailers' perceptions of a wide range of UPC scanner checkout system characteristics. Food retailers comprised of two sampling frames, namely, installers and non-installers of scanner checkouts. A comparison of their perceptions reveals that they differ significantly on seventeen of sixty items considered in the study. A factor analysis of the items generated twenty-one factors. Installers and non-installers differ significantly on seven of twenty-one categories. A discriminant function based on the twenty-one factor-category correctly classified 80.5 percent of the retailers into the installer and non-installer groups.

Based on the results present in the preceding section, it may be tentatively concluded that installers perceive the scanner checkout system as favorably as projected in the popular press and trade journals. However, their favorable attitude towards the innovation may be attributed to their post-installation rationalization, and/or to their hands-on experience with the system which enables them to truly realize the intended benefits.

Regarding the item price removal controversy, this study documents the food retailers point of view. While the majority of installers perceived item price removal not to lessen shoppers' price consciousness, interestingly, installers were equally split in their perception of the possibility that shoppers could be charged prices higher than shelf-marked prices in scanner equipped supermarkets. Therefore, consumer advocates who in the past have opposed item price removal citing the potential for supermarket "rip-offs" as one of the reasons, may find considerable support among food retailers themselves. Regarding another controversial issue concerning labor cut-backs, a majority of installers did not foresee any cut-backs in the number of employees because of increased operational productivity.

This study also documents for the first time the attitudes of food retailers who have not installed UPC scanner checkouts in their supermarkets. Overall, non-installers exhibited a remarkable degree of familiarilty on almost all aspects of the innovation. A closer examination of their responses reveals that they tend to be cautious in ther evaluation of the innovation, and often take a neutral position on issues calling for actual experience with the system.

Given the nature of competition in food retailing, it is foreseeable that greater number of non-installers will opt for scanner checkouts in the near future. Based on the present preliminary analysis it is tentatively recommended that marketers of scanner equipment:

* Emphasize on scanner checkout benefits such as cost effectiveness, efficiency of customer credit check or check authorization, and potential for sales increases due to faster checkouts.

* Emphasize on customer satisfaction with the speed of checkout, checkout register tape receipt, and the accuracy with which scanners price and weigh purchased items.

* Emphasize on the operational reliability of the system when ordered.

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