

A RETAIL STORE CLASSIFICATION TECHNIQUE BASED ON CUSTOMER BUYING BEHAVIOR

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Introduction

In June of 1971 a research study was initiated with the Ohio Department of Liquor Control (ODLC), for the purpose of improving the strategic planning of logistics system activities. The specific research problem was to develop and test a method which could be used by the Director of the ODLC to evaluate the future implications of his current logistics system designs. An essential element of the method used for the research study was the construction of a computer simulation model, which could be used for experimentation. This paper discusses one technique used in the construction of the ODLC logistics system simulation model.

Logistics System Model

The model used as the bases for the computer simulation depicted the physical flow of liquor products from the liquor vendor to the ultimate Ohio consumer. The logistics system managed by the ODLC was extensive and required significant aggregation of some transaction and decision areas before a computer simulation was feasible. A conceptual diagram of the ODLC logistics system is shown at Figure 1.

Liquor Product Categories

A researcher, studying the buying behavior of Ohio liquor consumers, utilized the concept of product group or product category, in order to simplify his data analysis.¹ The product categories were a further aggregation of categories of products, that were and are currently used in the trade. His research also indicated a

wide price range for each of the six major product categories accounting for the bulk of the sales revenues. In order for the model to discriminate major price differences between liquor products in the same product group, a high-low price break point was established. The resulting sixteen product categories used for constructing the model are shown in Figure 2.

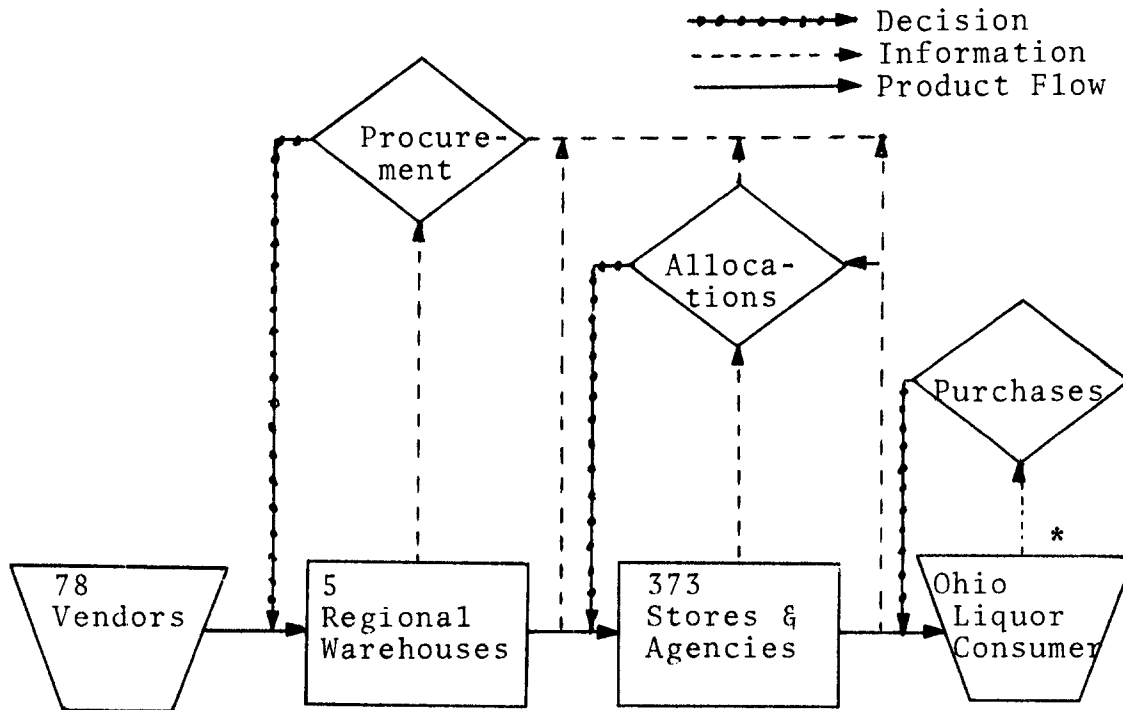
Consumer Buying Behavior

There were 299 stores and seventy-four agencies in existence during the 1969-1970 period of operations for which ODLC product movement data were available. Any attempt to simulate the sale of liquor products to consumers in that number of stores was judged to be infeasible, because of the size of the computer model that would result. The specific aspect of the overall research problem this portion of the design addressed was how to reduce the number of stores to be included in the simulation model, while still retaining meaningful variations reflecting consumer buying behavior.

A liquor store tends to serve a group of consumers, who are generally located within shopping distance. This is the idea of a store trading area. Since groupings of people on a geographical basis exhibit differences in average age, average income, life style, and a number of other demographic characteristics, it was hypothesized that these differences would be indicated in the particular mix of liquor product categories sold at each store. If a percentage of total store

Figure 1

CONCEPTUAL ODLC LOGISTICS SYSTEM MODEL



*approximately 850 products

dollar sales were computed for each product category, for each store, there should be differences in these percentage profiles, and the differences should reflect the buying behavior of consumers. This was found to be the case for a small number of stores studied previously.²

A program was written for the liquor product movement data maintained on magnetic tapes to compute for each store the percentage of total annual dollar sales accounted for by each of the sixteen product categories, for all stores in the state of Ohio. This later computation established the average store percentage profile, and was designated the STANDARD STORE. What was needed was a method of determining basic similarities and differences so that stores could be grouped into distinctive types.

Chi-Square Test

A chi-square "goodness of fit" test was made between the STANDARD STORE, or expected, percentage profile, and the actual store percentage profile. A 99% confidence level was used to insure that only highly significant differences would be isolated. Based on this test 288 stores were classified as STANDARD and 85 stores were classified as significantly different. Changing the confidence level to 95% would have added only 47 more stores to the significantly different category.

The next step in the analysis was to develop meaningful groupings for the 85 stores judged to be significantly different from the STANDARD STORE. Again the chi-square test was used. In this case each store was tested with every other

Figure 2

Liquor Product Categories

<u>No.</u>	<u>Code</u>	<u>Product Category</u>	<u>Price Breakout</u>
1	A1	Bourbon	⊆ \$5.50
2	A2		⊆ 5.50
3	B1	Blends	⊆ 5.00
4	B2		⊆ 5.00
5	C1	Canadian	⊆ 6.50
6	C2		⊆ 6.50
7	D1	Scotch	⊆ 7.00
8	D2		⊆ 7.00
9	E1	Gin	⊆ 4.50
10	E2		⊆ 4.50
11	F1	Vodka	⊆ 4.50
12	F2		⊆ 4.50
13	G	Brandy	
14	H	Rum	
15	I	Cordials and Liqueurs	
16	J	Specialties and Cocktails	

store. The same confidence level was used as previously. Stores were not judged to be alike until the chi-square test was significant in both directions between stores. These groupings were then plotted on a piece of paper with a solid line indicating a significant chi-square test in both directions. Most of the stores fell into seven clusters. However, there were some stores that could be considered to be in either of two clusters, and the final assignment of these stores to a store type was made by inspection of the particular percentage profile. The results of this store type analysis, with store type names and number of stores included, are shown in Figure 3.

The stores in a particular store type classification were then grouped and a new annual dollar sales percentage profile was computed for the store type. These percentage profiles are shown in Table 1.

Managerial Implication

The technique for classifying retail stores based on consumer buying behavior discussed above has several implications of interest to management. First, it highlights significant differences in stores which require special planning and control emphasis. For example, the unique Bourbon Stores and Low Price Bourbon Stores were all found in the central to south-western part of the state. This highlighted geographical differences. The unique High Price Scotch/Gin Stores, while only seven in number generated over \$12 million in revenue. This highlighted the income differences of these stores found in upper class suburbs. In both cases, for the most profitable results, planning and control efforts should recognize and respond to such store differences.

Second, the classification technique

Figure 3

STORE CLASSIFICATIONS

288 Stores Classified STANDARD

85 Stores Different

25 High Price Blends

13 Low Price Blends

16 Bourbon

6 Low Price Bourbon

6 Low Price Canadian

7 High Price Scotch/Gin

12 Low Price

Table 1

Percentage of Dollar Sales by Product Category for Each Type Liquor Store

Product Category		Store Type							
		Standard	High Price Blend	Low Price Blend	Bourbon	Low Price Bourbon	Low Price Canadian	High Price Scotch/Gin	Low Price
Bourbon	A1	14.03	8.10	15.15	26.23	33.62	12.69	10.90	9.19
	A2	8.47	7.05	6.63	17.35	14.85	7.58	11.96	2.18
Blend	B1	17.73	12.70	35.01	6.21	15.28	8.51	4.26	31.94
	B2	11.19	27.73	14.67	4.90	6.03	6.17	8.54	1.43
Canadian	C1	8.59	8.18	5.34	5.25	3.94	17.51	4.62	13.46
	C2	4.79	8.41	3.50	2.93	2.81	7.74	7.18	.61
Scotch	D1	7.17	3.77	1.61	9.59	2.82	10.60	9.21	13.10
	D2	5.24	4.91	1.37	9.31	2.14	10.82	14.61	1.18
Gin	E1	4.12	1.64	2.99	4.33	3.38	2.93	3.31	6.64
	E2	4.03	3.67	1.60	4.35	2.12	3.67	9.33	2.22
Vodka	F1	4.74	2.69	4.10	3.58	5.67	3.31	3.72	8.02
	F2	2.61	3.84	1.68	2.61	3.08	2.47	4.11	.28
Brandy	G	1.70	1.62	.46	1.11	.74	4.46	2.51	2.53
Rum	H	2.15	1.78	1.82	1.20	1.49	1.02	2.34	2.79
Cor/Liq.	I	2.76	3.04	3.44	.73	1.57	.37	2.59	3.94
Spec/Cock.	J	.68	.82	.63	.32	.46	.15	.81	.49

provides a basis for monitoring the changes in consumer buying behavior over time. For example, the store classification analysis could be made quarterly or annually, and any changes in the percentage profiles could be considered tentatively as representing shifts in consumer buying behavior. The specific causes of the shifts would not be of as much concern to the retailer as the fact that they are taking place. Knowing that such shifts in buying behavior are occurring would permit more informed procurement and distribution practices.

Third, the use of store classification analysis could be extended to develop some of the major determinants that cause specific percentage profiles. For liquor products, such variables as income, age, and ethnic origin appear to be significant determinants. With information on the ex-

pected product profile available to the retailer, initial stocking plans could be developed for new stores, which would more closely approximate the actual consumer demands in the new location. The actual percentage profiles experienced in a new store could be compared with what had been expected to determine if the store is realizing its potential.

¹Clyde Kenneth Walters, "An Empirical Analysis of Two Stockout Models," (unpublished Ph.D. dissertation, The Ohio State University, 1971), pp. 76-77.

²Bernard J. LaLonde, "A Summary Report of the Consumer Survey Segment of the Ohio Department of Liquor Control Study." Columbus, Ohio: The Ohio State University, 1972, p. 33 (Mimeographed).

NEW SOURCES OF INDUSTRY DATA

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The Super Market Institute has basically two types of research reports. There are regularly scheduled reports and research reports conducted for current industry needs. First I will describe the scheduled reports, which are distributed only to participants initially, and released to SMI's Information Service one year after issue.

Scheduled Reports

1. Operations Review (formerly Figure Exchange) - Profit, cost, and merchandising data with a store orientation. Four quarterly and one yearly report each

calendar year. Current Availability - Data from 1953 through the 2nd quarter 1972 is available now. Data from more current issues is available one year after the end of the calendar quarter of issue.

2. Headquarters & Distribution Cost Review - Itemized breakdown of expenses for the areas of distribution center, delivery, headquarters and electronic data processing. The first issue of this new report was distributed in July, 1973. Current Availability - Data not available until one year after issue.

3. Physical Distribution Review - Pri-