A Comparative Analysis of Computer Applications in Transportation and Distribution for Food Products Companies

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Examines and compares the extent of the use of computers by food firms and industry in general in the field of transportation and distribution.

Introduction

The food industry continues to be plagued by increasing costs, decreasing profit margins, and increasing product proliferation. Transportation and distribution activities emerged in recent years as a fruitful area of management, which have the potential for slowing or reversing the current adverse cost/profit trend. To accomplish this slowing or reversal, participants in food distribution channels have been advised to communicate, consult, and coordinate.(1)

A basic ingredient needed to accomplish communication, consultation and coordination in food distribution channels is the computer. Without the capability of the computer, and associated data communications, it would be virtually impossible to integrate the widely dispersed activities of food distribution channels. A recent survey of how 107 firms use computers in transportation and distribution provides some insights into how food products companies compare with industry in general, in the application of this key operating and management tool.

The Survey

A 4-page questionnaire was mailed in early August, 1972 to the highest ranking distribution executive in companies reflected in the membership rolls of the National Council of Physical Distribution Management. Out of 401 questionnaires mailed, 107 responses were received. The distribution of responses for all industries and for food products companies, indicating breakouts by annual sales volume, is shown in Table 1. The responses from food products companies constituted 21% of the total responses.

Since the total number of responses was small and there was a wide variation in the types of companies in the other category, no attempt was made in the initial survey report to draw conclusions on trends within a given industry. This paper will attempt, however, to draw conclusions for the food products companies recognizing in doing so, the limitation of the survey data.

Major Findings

One of the objectives of the study was to determine the extent to which the transportation and distribution function in each company had the internal capability to use computer facilities. The responses shown at Table 2, indicate that two-thirds of all companies have systems development capability, over half have input-output capability and over one-third have programming capability. Forty-two percent indicate they are using time-sharing. In every case, food products companies possess a better internal capability.

The locus of control of the computer capability was examined in the study at two levels: Transportation/Distribution

Table 1

Computer Applications
Distribution of Responses by Annual Sales

Industry	Annual Sales 100	100-500	500-1000	1000	N/S	Total
			- Number -			
Food	10	5	5	3		23
All Others	18	30	16	16	4	84
Total	28	35	21	19	4	107

Table 2

Extent of Computer Application

Internal Capability	Food	Agg.
	- Percent -	
Systems Dev.	69.6	66.1
Programming	43.5	34.9
Computer I/O	69.6	57.4
Time Sharing	54.5	41.7

Table 3

Computer Applications
Extent of Control

Title	Locus of P.D. Food	Computer Control Agg.
	- Percent -	
Mgr.-Dist.	21.7	20.7
Dir.-Dist.	13.0	13.1
Systems	8.7	12.1
Dist. Plan/Dev.	4.3	11.2
Mgr.-Date Proc.	17.4	8.4
Mgr.-Dist SVCS	8.7	7.5
Info SYS/SVCS	8.7	6.5
VP-Dist	4.3	2.8
Other	13.2	14.0
No Res.	--	3.7
Total	100.0	100.0

and Corporate. The responses indicating the Transportation/Distribution locus of control are shown in Table 3. The chief distribution executive controlled the computer activity in over one-third of the responding companies. A large number of respondents indicated that control rested with a T/D staff element. This staff element, by title, tended to be "systems" oriented for responding companies in general, while for the food products companies, the staff control element reported most often 17.4 percent was the Manager - Data Processing.

The responses indicating the corporate locus of control are shown in Table 4. Approximately two-thirds of all respondents indicated control rested in a "systems" oriented staff element, with one-third in a "data processing" oriented staff element. In the case of food products companies, these percentages were reversed. Considering both the T/D and corporate locus of control for the computer capability, it appears that food products companies view the bulk of their computer use as processing data.

When the companies surveyed were asked to list their three most critical problem areas, the unstructured responses tended to fall into the eleven categories shown in Table 5. The responses in general clustered around the following problem areas: specifi program applications, low priority, and lack of computer know-how. The food products companies in contrast did not report their receiving a low priority or their lack

Table 4

Computer Applications, Extent of Control

Title	Locus of Corporate Food	Computer Control Agg.
	- Percent -	
Mgmt. Info. SYS/SVCS	13.0	37.5
Date Processing	26.1	18.7
Controller/Treau/Fin	39.1	15.9
Corporate SYS/SVCS	8.7	13.1
Mgmt. SVCS	4.3	3.7
Corporate Admin.		3.7
Planning		2.8
Distribution		.9
Other	8.7	2.8
No Res.		.9
Total	100.0	100.0

Table 5

Critical Problems Encountered in Computer Applications

Problems	Most		Second		Third	
	Food	Agg.	Food	Agg.	Food	Agg.
			- Percent -			
Spec. Prog. Applic.	13.0	18.7	8.7	19.6	17.4	16.8
Low Priority	8.7	17.8	8.7	10.3	8.7	8.4
Output-Untimely/ Inadequate/Inflex	13.0	11.2	17.4	8.4	13.0	4.7
Input-Inaccurate	13.0	9.3	4.3	5.6		3.7
Lack-Time/Space	8.7	9.3	8.7	5.6	4.3	1.9
SYS Edit/Updating	13.0	6.5	17.4	8.4	4.3	2.8
Lack-Know How		6.5		8.4		10.3
Cost-SYS Dev.	8.7	5.6	4.3	2.8	4.3	2.8
Data Base-Inadequate		3.7	4.3	5.6	8.7	10.3
Other	8.7	3.7		.9		
No Res.	13.0	7.7	26.1	24.4	39.1	38.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

of computer know-how as critical problem areas. Rather, they saw their problems centering around developing and maintaining accurate, timely, flexible, up-to-date programs. This in all probability reflects their inability to keep up with the dynamic changes in consumer buying habits, and new product offerings experienced in food retailing.

The development of input-output computer capability has progressed from punched cards and paper tape, to cathode ray tubes and remote terminals. Respondents were asked to specify which kinds of input-output methods they had available to them, in an attempt to determine the relative importance of each, especially newer methods. The responses are shown in Table 6, and usage of a method indicates either as input, output or both. While punched cards and magnetic tape dominate in reported usage, companies in general are moving significantly toward the use of newer methods, especially remote data terminals and CRT. Food products companies, however, reported considerably fewer applications of CRT and optical reader.

Table 6

Computer Applications, I/O Available

Methods	Food	Agg.
	- Percent -	
Punched Cards	86.9	85.1
Magnetic Tape	82.5	78.5
Disc	60.9	63.5
Paper Tape	47.8	43.9
CRT	17.4	31.7
Optical Reader	4.3	18.4
Remote Data Term	56.5	54.7
Other	N/A	15.9

The study also examined the extent to which responding companies had made use of or planned to make use of the computer in specific program applications. Table 7 shows applications which are found within the transportation activity. Bill of lading preparation and carrier payment were in general the most common applications. Fewer food products companies had a capability to handle freight rates, but 26.1 percent indicated this was under development. Food products companies reported a significantly greater interest in expanding their capability for shipment and vehicle routing; however, they had less capability to evaluate carrier services.

An analysis of specific distribution program applications, other than transportation, indicated that inventory control and order processing programs were most common, Table 8. In general, companies indicated a considerable capability to handle certain problem-solving/decision-making situations: facilities location, shipment forecasting, systems modeling, and consolidation. Food products companies reported at least a 50 percent less present capability for handling problem-solving/decision-making situations, but indicated strong activity in the development and planning stage, with the exception of applications to system modeling.

Time-sharing systems provide transportation and distribution managers a flexible and efficient way to interact with their supporting computer facility. Table 9 shows how this capability is presently being used. While food products companies have less overall capability in the strategic and operating applications listed, they appear to be utilizing this capability more often in a time-sharing mode.

Conclusions

In comparing the computer applications of transportation and distribution functions of food products companies (including groceries), with American Industry in general, based on the collective view of 107 firms, the following general conclusions can be made:

1. Food products companies report more extensive present use of the computer in data manipulation applications (bill of lading preparation, inventory control, order processing).

Table 7

Computer Applications in Transportation
Current and Planned

Activity	Present		Dev.		Plan	
	Food	Agg.	Food	Agg.	Food	Agg.
			- Percent -			
B/L Prep.	56.5	49.5	13.0	12.1	4.3	9.3
Carrier Pay	30.4	35.5	13.0	8.4	17.4	24.3
Shipmt. Routing	30.4	33.6	4.3	11.2	39.1	17.8
R/R Fleet Contr.	21.7	21.5	4.3	2.8	8.7	4.7
Tracing	13.0	16.9	4.3	2.8	4.3	6.5
Freight Rates	4.3	16.8	26.1	15.9	8.7	23.4
Carrier Eval.	4.3	15.9	4.3	6.5		
Vehicle Routing	13.0	11.2	8.7	4.7	30.4	15.0

Table 8

Computer Applications, Current and Planned - Other P.D.

Activity	Present		Dev.		Plan	
	Food	Agg.	Food	Agg.	Food	Agg.
			- Percent -			
Inventory Contr	87.0	84.1		3.7		4.7
Order Process	82.6	79.4	8.7	6.5	4.3	6.5
Fac. Studies	21.7	45.8	17.4	8.4	4.3	8.4
Shipment Forecast	17.4	41.1	4.3	10.3	21.7	14.0
SYS. Modeling	17.4	35.5	4.3	7.5	4.3	7.5
Consolidation	8.7	15.2	13.0	11.2	17.3	14.0
Alloc/Contr		6.5		1.9	4.3	.9
Dist. Cost/Budgeting		6.5		.9		
Simulation		4.6				1.9
Plan/Forecast		1.9		.9	4.3	.9

Table 9

Computer Applications, Current and Planned - Time Sharing

Activity	Food	Agg.
	- Percent -	
Fac. Studies	26.1	17.8
Sys. Model	21.7	16.8
Inventory Contr.	4.3	8.4
Shipment Forecast	13.0	7.5
Carrier Eval.		2.8
R/R Fleet Contr.		1.9
Vehicle Routing		1.9
Other	N/A	10.0

2. Food products companies report significantly fewer uses of the computer in problem-solving/decision-making applications (facilities studies, system modeling, shipment forecasting, simulation).

3. More than twice as many food products companies report plans to integrate transportation planning activities into their operations (shipment routing, vehicle routing).

4. The food products companies possess a better internal capability in all areas to make use of the computer.

5. Food products companies report the locus of computer control more frequently in "data processing" type organizational elements (Manager-Data Processing; Controller/Treasurer/Finance).

6. The major problems faced by food products companies in applying the computer are in the area of developing and maintaining accurate, timely, flexible, up-to-date programs.

7. Food products companies report a significantly limited capability in newer areas of computer input-output--CRT and optical readers.

Literature Cited

(1) La Londe, B. J. and Wayman, W. S. Jr., "Physical Distribution and the Food Industry in the 1970's", Atlanta Economic Review, October, 1972, pp. 42-43.