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THE ROLE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT IN SELECTED LARGE DEPARTMENT STORES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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* * * * * *

The Ohio State University
1965

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CHAPTER I

INTRODUCTION TO STUDY

Automatic data processing is the substitution of mechanical, electro-mechanical or electronic means for repetitive manual clerical jobs. The degree of complexity of the clerical job that may be done automatically depends upon the nature of the application, the capabilities of the data processing equipment and the skill with which it is used.

Automatic data processing of information is justified in many segments of business and government.[1] Wherever the need for information is a well-developed part of a business operation, automatic data processing equipment may be used to advantage. However, it must be recognized that data processing is primarily a supporting activity in most businesses and not an end in itself.[2] Data processing activities are derived from the particular information and operating characteristics of the firm.

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[1] "Why Office Automation is Justified," Office Automation, Part I - Section C (New York: Automation Consultants, 1962).

[2] Alan O. Mann, "The Philosophy of Integrated Data Processing," in Systems and Procedures Quarterly, November 1956, pp. 2-7.

Objectives of the Study

The purpose of this study is to examine the customary function or role of automatic data processing in the inventory management practices of large locally managed department stores. By means of a comprehensive analysis of leading large department stores, the use of data processing, the effect of use, and other related factors in inventory management are examined. The study treats the present benefits of use, the nature of successful and unsuccessful applications, and an appraisal of the overall contribution to inventory management in the sample stores.

The study is designed to provide the basis for a comprehensive analysis of the relationships that give substance to the nature of automatic data processing applications in department store inventory management. Although the results of this study are limited to the sample stores, selected findings are probably valid for a larger number of stores. Most large department stores are aware of inventory management methods used in other department stores and promising techniques of inventory management and their results are diffused throughout the industry. Diffusion of information is facilitated by the computer manufacturers who work with many stores, information interchange programs among stores in ownership groups and buying groups, the National Retail Merchants Association, publications and conferences, the trade press of retailing, and studies of this nature.

Procedure

The study, by intent, is a concentrated examination of a cross-section of departments in selected department stores. The role of automatic data processing in inventory management is delineated by six major study areas that make up the segments of the analysis. Information for the individual study areas is collected and separately evaluated before being used to construct the multi-dimensional analysis of role. Findings are developed by cross-analyzing these areas of investigation. The study segments provide guidelines and are used as a framework in the research design and data collection method development. The areas are as follows: (1) the comparative use of data processing, (2) the organization position of the automatic data processing section, (3) the applications of automatic data processing in inventory management systems, (4) the application characteristics, (5) the reasons for use, and (6) the results of use. Each of these areas will be discussed in detail in the study design chapter.

Background Information

Reasonable success has been reported by department stores in automating important clerical functions associated with payroll, accounts receivable, and sales audit. In spite of these applications, the promise of substantial

gains from automating functions of merchandise control is purportedly lagging.[3]

In department store inventory management, as in other applications, the successful use of automatic data processing equipment is heavily dependent upon an economically sound system. Economies in automatic data processing are not easily achieved, and many applications are coming under closer scrutiny as the initial appeal is dimmed by reports of high cost and unfilled returns.[4] The contribution of automatic data processing in department store inventory management, for example, is far from clear.[5]

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[3]This thesis is presented by Malcolm McNair and Eleanor May, The American Department Store, 1920-1960 (Soldiers Field: Harvard Business School, 1963) and Donald Blumberg, "New Directions for Computer Technology and Applications ... A Long Range Prediction," in Computers and Automation, January, 1964, p. 11.

[4]John T. Garrity, Getting the Most Out of Your Computer (New York: McKinsey and Co., undated), p. 2.

[5]Kenneth R. Lavery, "The Future Role of Computers in Retailing," Retail Control, September, 1963, pp. 32-53.

Aside from some unfavorable results and documented cases of technologic and economic failure,[6] the potential is readily apparent. Recent data indicates that the cost of merchandise planning, buying, and related activities in the average department store absorbs about 5 per cent of the sales dollar. In contrast, commonly automated activities of payroll and accounting absorb only 0.6 per cent, and sales audit, another favored application, only 0.2 per cent.[7]

Inventory Management Systems

Inventory management systems in a department store are largely of the open-loop variety. The information output provides the basis for inventory management decisions. Planning and control do not occur automatically as the result of the data system, but are achieved by interpreting and translating information into action.[8]

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[6]Several unsuccessful experiments are discussed in George Kozmetsky and Paul Kircher, Electronic Computers and Management Control (New York: McGraw-Hill, 1956).

[7]Merchandise and Operating Results of Department and Specialty Stores, 1962 (New York: National Retail Merchants Association, 1963).

[8]Delbert Duncan and Charles Phillips, Retailing: Principles and Methods (Homewood: Richard D. Irwin, 1959), p. 335.

Inventory management is based on the sound judgment of a buyer or department manager supported by comprehensive and timely information. Automatic data processing based inventory management systems will not eliminate the manager. They will facilitate the clerical process of obtaining adequate information for making decisions.

As a result of many changes, the average department store buyer can no longer rely on visual observation to control merchandise movement and stock position.[9] Even the traditional cumulative record of merchandise purchases and stock position is cumbersome and often of questionable accuracy. Whether automatic data processing will ever be able to substantially reduce the expense of inventory management or aid in the more difficult problem of improving merchandising performance is viewed as a matter of speculation.[10]

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[9]Alfred Engle, "Visual and Staple Stock Control," Retail Control, October, 1961, pp. 83-88.

[10]Everett S. Calhoun, "Latest Developments in the Field of Data Processing," Retail Control, March, 1963, pp. 8-22.

Pressures on Department Store Merchandise Management

The use of automatic data processing in department store inventory management does not mean that historical merchandise management procedures have been automated. Department stores are not coping with the same inventory management problems that existed even several years ago. Significant changes have occurred that complicate the needs of an inventory management system and provide incentive for improved methods.

Most department stores are experiencing increased competition from other segments of retailing.[11] This competition places a heavy penalty on such merchandising errors as poor merchandise selection, inadequate assortment breadth, out-of-stock conditions, and premium prices for comparable goods. In addition, many department store managers have not adequately offset pressures causing lower inventory turnover and the consequent reduction of profit.[12]

Three trends directly affecting the need for improved inventory management systems in place of many traditional methods are discussed.

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[11] Ed Gold, The Dynamics of Retailing, Major Trends That Shape The Future (New York: Fairchild Publications, 1963).

[12] Malcolm McNair, "Highlights of the New Harvard Report," Stores, December, 1962, p. 10.

Number of Merchandise Items

The number of fashion conscious customers and the demand for selection variety has contributed to an expansion of the number of items being offered for sale in some departments in many department stores. There is also a growing sensitivity to "features and characteristics" reported by many buyers.[13]

An inventory management system designed for operating conditions in 1950 would likely be over-loaded by a substantial stocking increase. The requirements for processing unit information and making periodic stock counts alone affects a store's cost structure. Wider assortments can materially affect the merchandise management requirements in a department store, and many stores are actively competing with discount type stores on the basis of broad selection.[14]

Assortment breadth is part of a department store's merchandise management problem; although new innovations such as key resource programs are helpful in reducing the assortments and the resulting problems.[15]

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[13]Herbert Leeds, "What Does Inventory Management Really Mean?," Retail Control, October 1963, p. 24.

[14]"Planning The Direction For Your Store," Department Store Economist, April, 1964, p. 22.

[15]"Programmed Merchandising: The New Way to Work With Key Resources," Department Store Economist, October, 1964, p. 22.

Managing branch stocks

The continuing growth of branch stores has increased the need for "remote control" in the management of merchandise.[16, 17] In certain branch stores, responsibility for branch stocks is decentralized to branch personnel. The degree of autonomy granted branches in the management of their stock is influenced by such factors as the branch's distance from the parent store and the number of branches operated by the parent store in addition to the type of merchandise and the number of selling locations.[18]

The importance of inventory records where branch store inventory is centrally managed has long been recognized. In The Buyer's Manual, a handbook prepared by the National Retail Merchants Association, is the following comment:[19]

> The advent of multiple store operation in the department store field has made it necessary

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[16] Ed Gold, op. cit.

[17] An analysis of data for department stores with over fifty million dollars annual sales reported in Merchandise and Operating Results of Department and Specialty Stores indicates an increase in the sales contribution of branches in each of ten years 1952-1962.

[18] Clinton L. Oaks, Managing Suburban Branches of Department Stores (Stanford: Stanford University Graduate School of Business, 1957), p. 7.

[19] George W. Johns, "Buying to Meet Consumer Demand," in The Buyers Manual (New York: National Retail Merchants Association, 1957), pp. 52-61.

> for buyers and merchandising men to place a new importance on their stock and sales records in each store. Some buyers are operating departments today in as many as ten locations, in effect, they are chain store buyers. It is obvious that when the buyer has but one department to buy for and manage, he can to some degree rely on visual control, but the modern multiple store buyer must learn to sense customer demand largely through the interpretation of his stock and sales records. These records vary with the type of department, but the buyer must have, in usable form, the stock and sales records of his merchandise by item, price, color, size, price line, and type of classification depending upon the requirements of his department.

As centrally managed branch stocks become more prevalent, effectiveness of a data based management system becomes critical. For example, the clerical problem of a buyer trying to determine his on-hand position and location of any item at a given moment is complex. The current need, then, is for a comprehensive, timely, and accurate inventory management system that is data oriented.

Developments in scientific inventory management

Advances in merchandise management techniques have resulted from the recent developments in inventory management theory.[20] It is generally concluded that the major or structural problems of inventory management are well

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[20]For several representative examples see Joseph Buchan and Ernest Koenigsberg, Scientific Inventory Management (Englewood Cliffs: Prentice-Hall, 1963).

documented and that an adequate body of theory exists with which to build inventory management systems.[21] In inventory management applications, as in others, the problem is the gap between valid theory, practical application, and economic performance. Even where the application of theoretical inventory management methods have been demonstrated as technically possible, they may not be economically feasible. Economic desirability would require a benefit/cost ratio substantially greater than one depending upon the certainty of obtaining the benefits and controlling the costs.

Two inventory management systems for department stores are cited as examples of scientific advances in this area.

Staple merchandise management Because of the alleged repetitive activities of staple merchandise management, many of the present applications of scientific inventory management are made in this area. One recent application provides an example of the reduction in inventory quantity that can be made with advanced inventory management methods.[22] Of a sample of 115 items with

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[21] John A. Postley, Computers and People (New York: McGraw-Hill, 1960), p. 7.

[22] John Boyle, "A new Look At Staple Stock Control," an address at the Controllers Congress of The National Retail Merchants Association convention, May 28, 1964.

average monthly sales rates between twenty units to less than five units, a 40 per cent reduction in inventory quantity was achieved. When order lead time was reduced from the normal four week period to two weeks, the on-hand inventory requirements dropped 49 per cent.

Similar results have been reported by several manufacturers of data processing equipment who have developed scientific inventory management techniques to aid in the sale of data processing equipment.[23] Techniques of staple inventory management lend themselves to data processing. The data processing program continually evaluates the sales volume, level of inventory, and stock shortages for selected items. Variations from planned limits are reported on an exception basis. In the typical program, data is often subject to elaborate statistical calculations that are expensive and time consuming if made by manual methods.

Fashion merchandise management The fundamental difference between management of staple merchandise and fashion merchandise inventories can be traced to the shorter style life of the fashion merchandise. Style life of fashion merchandise is the basis for one

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[23]See Office Automation Applications (New York: Automation Consultants, undated), Part III - Section F, Retail and Wholesale Trade.

management system developed by the Arthur Andersen Company.[24] In this system, the sales rates of selected items are followed closely and an early evaluation of fast and slow moving items is made. The advantages of this system are claimed to be:[25]

1. Highlighting of fast movers rapidly, providing a basis for prompt reorders.

2. Spotting slow movers quickly, providing reliable data for timely markdowns.

3. Pinpointing transfer opportunities early (for multiple store operations).

This system is estimated to be as economical to operate manually as the traditional clerical approach, although it is ideally suited to automatic data processing installations. Merchandising data collected and organized for this system can then be easily used for preparing unit, size, and color forecasts. In some cases, a resident buying office may maintain all the necessary data for their clients and provide management reports at frequent intervals.[26]

The results of style movement identification is illustrated by the reported results of a test by the International Business Machines Company. Their fashion

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[24]James Brice, "Style Life Inventory Management," an address at the Controllers Congress of The National Retail Merchants Association convention, May 27, 1964.

[25]Phillip Carlson, "The Control of Fashion Inventories," Stores, June 1961, p. 23.

[26]Beatrice Judelle, "Inventory Control in Fashion Departments," Stores, May 1963, p. 40.

merchandise management system is based on sales-to-stock ratios that are statistically evaluated and was able to give the following performance in a department with 650 styles under control.[27]

Activity	Buyer's Performance	Fashion System
Selection of "fast" sellers	78 styles in 25 days	205 styles in 13 days
Selection of "slow" sellers	26 styles in 25 days	140 styles in 10 days

It is apparent that this system goes beyond the tabulation of sales movement data or stock position reporting and supplies the buyer with information from which immediate inventory management decisions can be made. There is no indication that this system can be economically operated on a manual basis since it is for use with IBM data processing equipment.

The current reports of tests and applications of scientific inventory management methods strongly indicate that operating advantages can be obtained. However, these advantages cannot be considered in an economic vacuum. The use of more elaborate and complex methods of supplying inventory management must be accompanied by off-setting

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[27]Archie McGill, "A Breakthrough In Inventory Management," an address at the Controllers Congress of The National Retail Merchants Association convention, May 28, 1964.

savings. Stores that are able to process the required data in an economical manner are in a position to get advantages from appropriate use of scientific inventory management techniques.

CHAPTER II

SAMPLE DESIGN

From a preliminary selection of nine leading large department stores with annual sales volume in excess of fifty million dollars, five stores were selected for study. In addition to sales volume, the stores were selected for the nature of their operation which included branch store operation. Next, departments within these stores were selected for study on the basis of their inventory management problem characteristics.

Store Sample

Many characteristics of stores are described by the term department store. In its broadest meaning, any store selling general merchandise that is organized into departments may be described as a department store. Only traditional department stores are considered in this study. Excluded were promotional department stores, junior department stores, chain department stores, and others that would be included in the Bureau of Census's description of department stores.[28]

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[28] U.S. Census of Business, 1958, Retail Trade (Washington: Government Printing Office, 1961).

All stores in the sample are traditional downtown stores that are leaders in their trading area and leaders in the department store industry. All stores have a well developed automatic data processing installation and have advanced equipment capability for a wide range of inventory management information processing.

Sales Volume

A relationship between department store sales volume and the use of automatic data processing has been determined by a National Retail Merchants Association survey.[29] Except for routine use of business machines, the predominant number of applications of automatic data processing are in the larger department stores. One reason for this occurrence is that larger stores have the necessary financial capacity to purchase or lease data processing equipment and to operate it for extended periods of time before the application justifies its investment--if ever. The larger department stores have an above average opportunity for gain from the use of automatic data processing since they operate larger economic units and receive a greater proportion of their sales volume from diversified branch operations. The relative economic advantages that can

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[29] "A Comparative Report on Data Processing Equipment In Member Stores of The National Retail Merchants Association" (New York: National Retail Merchants Association, 1958).

accrue to the larger department stores does not preclude smaller retail units from getting similar operating advantages. However, the larger stores are generally better able to develop and introduce techniques of inventory management that will use the capabilities of automatic data processing to its maximum under the present state of the art.[30] It is for this reason that the selection of the store sample was made from the larger sales volume stores.

Precise sales volume figures for larger stores is difficult to determine since many do not report sales and profit information individually. These stores are usually owned by ownership groups who report sales and profits at the corporate level for the group as a whole.[31] Occasionally, trade publications indicate sales volume estimates for a single store operated by an ownership group. Such data is sporadic and often of questionable accuracy. Thus, the selection of department stores relied on sales volume information that openly was available.

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[30]"Why Data Processing," Department Store Economist, September, 1964, p. 22, reports the predominant number of stores surveyed using data processing equipment had annual sales volume in excess of twenty million dollars.

[31]Ownership groups are a distinct chain operation that does not maintain common identification of stores. For further discussion see Theodore N. Beckman and William R. Davidson, Marketing (New York: Ronald Press, 1960), p. 181.

Before selecting sample stores to be contacted, census data and trade sources were examined. Stores are usually grouped by sales volume categories, the top being fifty million and above in annual sales. This open-end category is inadequate to provide a basis for selecting very large department stores, say those with over one hundred million dollars annual sales volume, from smaller stores. The selection of stores was made within the maximum dollar category available of fifty million dollars.

Store Sample Selection

The list of sample department stores selected for study are shown in Exhibit 1. These stores were selected from a list of leading department stores in major trading areas. The following criteria was used for store selection:

1. Annual sales volume in excess of fifty million dollars.
2. Traditional downtown type department stores.
3. Established automatic data processing department.
4. Established branch store operation.
5. Five leading department stores.
6. Midwestern location.

EXHIBIT 1

DEPARTMENT STORE SAMPLE AND DATA PROCESSING EQUIPMENT IN USE FOR SELECTED FIRMS

Store	Automatic Data Processing Equipment
The Higbee Company Public Square Cleveland, Ohio 44113	IBM 1401 Card
The J. L. Hudson Company 1206 Woodward Avenue Detroit, Michigan 48226	IBM 1401 Card
The Carson, Pirie, Scott Company State and Madison Streets Chicago, Illinois 60603	IBM 1401
The Marshall Field and Company 111 N. State Street Chicago, Illinois 60603	Univac 1004
The F. and R. Lazarus Company High and Town Streets Columbus, Ohio 43216	NCR 304 and 315

Source: Leading Department Stores In Leading Trading Areas (New York: Hearst Magazines Research-Marketing Department, 1962) and "Retail Organizations Using Computers," June 13, 1963; a listing supplied by The National Retail Merchants Association.

The model of the central processer in the automatic data processing installation is listed for information purposes only.

At the request of several stores, specific information in the study is not identified by store name. The sample stores, therefore, are anonymously designated by number in the study.

Inventory Management Problem Definition

The inventory management problems selected for study are based on a classification proposed by authors of inventory control theory. Besides two widely used divisions, a third factor, the perishability of the merchandise inventory is added. The classification system is then modified to be compatible with department store merchandise classifications.

Background

Two authors of inventory control theory group inventory control problems into six categories according to (1) three types of demand for the inventory for (2) two degrees of continuity of the inventory management process.[32] The nature of demand is described as being uncertain,

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[32]Martin K. Starr and David W. Miller, Inventory Control: Theory and Practice (Englewood Cliffs: Prentice-Hall, 1963).

subject to risk, and certain depending upon the degree to which the demand can be predicted. The control of inventories in each of these categories may occur as a static or dynamic process. Static inventory processes are ones where a fixed amount of inventory in available in a given time period and no additions or replenishments can be made to the initial stock. Dynamic processes are ones that are on-going over a period of time. Additions and replenishments, as well as close-outs, can be made to an initial stock at any time they are necessary and possible.

Demand Classification

The theoretical inventory control framework presented some difficulties when an attempt was made to isolate department store inventory problems that could be labeled with these descriptions. In this study, the classification system is restated to be compatable with department store problems using the theory as a guide, but not limited to its rigorous definition.

Random demand

Theoretical uncertain demand occurs when the extent and occurrence or variance of demand cannot be predicted with meaningful accuracy. This degree of uncertainty does not usually occur from the department store buyer's point of view. Demand that is similar in practice would appear to be more of a random variance from the best estimate rather than wholely uncertain. Total dollar sales for a given line or assortment could be approximated by forecast, even though the pattern of sales is completely unknown and unexpected. A line of merchandise could be sold out rapidly at the beginning of the season at anticipated dollar volume. The total sales volume is some what known, but the demand characteristics are uncertain. At the other extreme, the entire line of merchandise may move slowly until markdowns or extra promotion facilitate inventory clearance at the season's close. Total sales volume is not completely unknown since merchandise inventory is requisite to sales. The category of uncertain demand as it applies to the department store is defined as random demand from estimated sales for the time period of the estimate.

Fluctuating demand

Demand under risk can be anticipated on the basis of past sales performance. The anticipated sales volume and sales rates as a function of time can be determined in a probabilistic manner from historical data. In department store inventory management, the estimated demand is likely limited to demand extremes. That is, the historical high and low demands are known and provide planning guidelines. This approach does not fully meet the criteria of demand under risk since probabilities are not developed. For the purpose of study area selection, demand under risk is designated as fluctuating demand since the extremes of demand variation are more easily determined from historical demand data. Under conditions of fluctuating demand it is expected that the total seasonal demand for a line of merchandise can be fairly well anticipated, but the sales of individual items can only be estimated within historical limits. That is, demand would usually fluctuate within estimated limits from the sales plan.

Predictable demand

Demand under certainty does not apply to merchandise sold in a department store. The sales rate of any item, no matter

how constant, is to some degree subject to the variation of customer purchase behavior that cannot be fully anticipated. The characteristics of demand that closely approximate a condition of certain demand is stable or predictable demand. This does not mean that the demand is constant, but rather demand variations are slight and well defined within a narrow range.

Merchandise Perishability

Inventory deterioration may occur from many causes. Common losses in inventory value result from shelf stock being shop worn from customer handling and movement within the store or between branches. Another form of deterioration that must be recognized is fashion perishability, the obsolescence of desirability.[33] Fashion perishability is used to designate that inventory deterioration resulting from reduced desirability rather than from shop wear. The latter factor is likely subject to a certain amount of managerial control, whereas fashion perishability can rarely be controlled.

Fashion perishability can range from highly significant in high fashion apparel management to unimportant for hardware and similar items. In a department store the

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[33]Beckman and Davidson, op. cit., p. 435.

requirements for inventory management are subject to varying degrees of fashion perishability. To complete the classification system three dimensions of fashion perishability were added to the inventory demand variables. These categories are designated as fashion perishability, partial fashion perishability, and staple merchandise.

Problem Area Selection

The variables of an inventory management problem are described as the nature of demand, the degree of fashion perishability, and the continuity of the inventory management process. The combination of the first two variables were used to determine application study areas which may occur in a static or dynamic process. Exhibit 2 illustrates a matrix of possible combinations of inventory demand and fashion perishability characteristics. Application areas can theoretically occur at the intersection of any row and column variable. This is not fully the case in reality since the nature of merchandise demand is not independent of the merchandise characteristics. For example, a high degree of fashion perishability and predictable demand are opposing phenomena. The change of fashion acceptance from one season to the next precludes historical sales data from which estimates of demand can be made. At the other corner of the matrix is the combination of staple merchandise and random

demand. Since by nature a staple item would have a relatively long product acceptance period, demand can be somewhat anticipated from past history.

EXHIBIT 2

MATRIX OF POSSIBLE DEMAND AND INVENTORY CHARACTERISTIC COMBINATIONS

Nature of Demand	Nature of Merchandise Inventory		
	Staple	Partially Fashion Perishable	Fashion Perishable
Random	*	*	3
Fluctuating	(1)	2	(3)
Predictable	1	(2)	*

Note: Asterisk indicates absence of an applicable merchandise classification. Parentheses indicate possible variation of classification.

The most logical combination of demand and inventory characteristics are indicated by the numbers 1, 2, 3. Some overlap is found in the merchandise categories selected for analysis. Since sharp divisions were not usually apparent in practice, the numbers in parentheses indicate variation in the theoretical division and are considered part of the similarily numbered categories. The inventory management

problem areas studied are designated: (1) predictable demand and staple merchandise, (2) fluctuating demand and partial fashion perishability, and (3) random demand and fashion perishability.

Merchandise Classifications Selected For Study

The departments and classifications studied are defined in this section. In order to analyze the role of automatic data processing in actual inventory management, areas of possible application are delineated on the basis of the theoretical framework developed in the previous section. This segmentation is needed because, while many basic activities of merchandise management are pervasive to all departments, the methods by which these activities are performed are not.

Random Demand and Fashion Perishability

Demand is described as random when no previous sales history has occurred or the history has shown widely varying sales rates. Characteristics of random demand are usually present where a substantial number of items are fashion

changeable each season. In addition, a high degree of fashion perishability is present in this category of merchandise.

The tenure of style acceptability is an important factor in the management of fashion inventories. One measure of style duration is the number of selling days merchandise can be actively sold at full retail. Style life on the order of 40 to 50 selling days by this measure is not unusual for fashion merchandise.[34] This merchandise has a high risk of obsolescence and there is little reason to hold inventory from one merchandising season to the next as the continuing popularity of a particular item is not assured. An accepted practice, and usually the least expensive is to mark down whatever remains at the end of the season until it is sold.[35]

Many fashion items are likely to be purchased preseason, particularly imported items and fashions produced by small specialty manufacturers who produce only after firm orders have been placed on the basis of samples. The degree of customer acceptance is largely unknown at the time buying decisions must be made. The risk in ordering this merchandise is high, but the potential profit is equally high. Inventory control techniques are likely to be of greater

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[34]James Brice, "A New Technique For Exception Reporting For Fashion Departments," an address at the Controllers Congress of The National retail Merchants Association convention, May 27, 1964.

[35]William R. Davidson and Paul L. Brown, Retailing Management (New York: Ronald Press, 1960), p. 417.

value when applied at the planning stage. After a buying committment is made, only a limited amount of control can be accomplished beyond locating the slow moving items for appropriate action.

Exhibit 3 lists five classifications of fashion merchandise where a major inventory management problem effort involves the characteristics of random demand and fashion perishability. Not all items within the classification are necessarily in this category, but the bulk of the items that are, require dealing with this type of problem.

Confirmation of the nature of the merchandise management task and the merchandise in this category was part of the research design.

Fluctuating Demand and Partial Fashion Perishability

Merchandise items in this category are not clearly fashion perishable in one selling season, nor are they staple for extended periods of time. Within a merchandise line there is partial fashion perishability. Some variations are experienced annually as part of the merchandise line change, but those lines that do change may be expected to endure for several seasons. Major styles are fairly stable and a majority of colors, fabrics, and patterns are standard for longer than one merchandising season. Inventory can possibly

EXHIBIT 3

DEPARTMENTS AND CLASSIFICATIONS AND THEIR RELATIVE SALES VOLUME SELECTED FOR CHARACTERISTICS OF RANDOM DEMAND AND FASHION PERISHABILITY

(Department stores reporting over fifty million dollars annual sales in 1962)

Department and Classification		Sales as a Percentage of Total Store	
Number	Merchandise Description	Main Store	Branches
45-11	Housedresses	.8%	1.2%
39-21	Women's Better Shoes	1.4	1.0
42-31	Women's & Misses' Dresses	1.2	.8
42-33	Formals & Bridals	1.4	1.9
43-21	Better Blouses	.3	.5
	Total	5.1%	5.4%

Source: Departmental Merchandising and Operating Results of 1962 (New York: Controllers Congress of the National Retail Merchants Association, 1963). and Departmental Merchandise Content Manual (New York: Controllers Congress of The National Retail Merchants Association, 1963).

be held over from one merchandising season to another or sold post-season without an unusual amount of markdown. Demand is characterized as fluctuating. Coupling this fluctuation with potential fashion obsolescence yields this particular category of inventory management problems. These problems are not as transitory as those encountered in fashion merchandise management, but have an element of variability not found in staple merchandise management. Compared with high fashion merchandising, the penalty associated with blind buying and post-season stock clearance is not as severe. Because of the somewhat more enduring fashion acceptance of many merchandise items, returns to vendors and storage for next season's sale are expected.

Exhibit 4 lists six classifications of merchandise that contain items which possess characteristics of fluctuating demand and partial fashion perishability.

Staple Merchandise and Predictable Demand

Average demand for items in this category are predictable, although variable selling peaks may occur during holiday and special promotion periods. For these demand peaks, additional stocks may be purchased specifically for each event in addition to normal stock maintenance requirements.

EXHIBIT 4

DEPARTMENTS AND CLASSIFICATIONS AND THEIR RELATIVE SALES VOLUME SELECTED FOR CHARACTERISTICS OF FLUCTUATING DEMAND AND PARTIAL FASHION PERISHABILITY

(Department stores reporting over fifty million dollars annual sales in 1962)

Department and Classification		Sales as a Percentage of Total Store	
Number	Merchandise Description	Main Store	Branches
36-00	Corsets & Brassieres	1.5%	2.2%
37-00	Hosiery	1.2	1.7
38-12	Negligees & Robes	.4	.7
39-23	Women's Inexpensive Shoes	.7	.9
51-11	Men's Furnishings	2.7	3.4
53-12	Men's Casual Furnishings	1.3	2.2
	Total	7.8%	11.1%

Source: same as Exhibit 3.

The problems associated with management of an inventory of staple items that sell at a predictable rate require different emphasis than inventory management methods used for fashion merchandise. The staple nature of these items places a high percentage of them on the "never out" list. Further, changes in product style and other item characteristics take place slowly over time, and product obsolescence usually can be anticipated in ample time to make necessary adjustments in inventory.

Exhibit 5 lists classifications that contain items which possess characteristics of staple merchandise and predictable demand.

EXHIBIT 5

DEPARTMENTS AND CLASSIFICATIONS AND THEIR RELATIVE SALES VOLUME SELECTED FOR CHARACTERISTICS OF PREDICTABLE DEMAND AND STAPLE MERCHANDISE

(Department stores reporting over fifty million dollars annual sales in 1962)

Department and Classification		Sales as a Percentage of Total Store	
Number	Merchandise Description	Main Store	Branches
15-11	Linens & Towels	1.2%	1.3%
22-11	Cosmetics	1.5	1.9
22-12	Drug & Drug Sundries	1.1	.8
66-11	Housewares	4.8	4.1
	Total	8.6%	8.1%

Source: Same as Exhibit 3

CHAPTER III

STUDY DESIGN

The role of automatic data processing in department store inventory management is measured by six major study objectives that were introduced on page three. The study examines this role for fifteen departments representing three inventory management problem areas for each of the stores in the sample. Measurement criteria and data collection methods are developed in this chapter. In the first section, each of the study objectives is explicitly presented with the method of data collection for each measurement being treated. In the second section, the questionnaire and interview format is presented.

Role Measurement

This section describes the six areas of role measurement presented in the introductory material.

Comparative Use

One significant measure of the role of automatic data processing in inventory management is the relative

use of the data-processing capabilities allocated to this activity.

The comparative use is measured by ranking the major data processing activities on the basis of processing load. Activities ranked are inventory management, payroll processing, accounts receivable, accounts payable, sales audit, personnel records, general accounting, and miscellaneous activities.

Organization Position

An overall measure that influences the role of automatic data processing in inventory management is the location of the data processing department in the organization structure of the department store. Organization responsibility has been shown to be an important factor in the successful use of data processing in department stores and many other companies. A study of twenty-seven companies by a leading consulting firm reports:[36]

> 1. Success is more heavily dependent on executive leadership than any other factor, such as type of industry, kind of computer, or application on which the computer is used.
>
> 2. In the above average company management views the computer effort no more sacrosanct than any other corporate activity and subject to the same management policies.
>
> 3. In the successful installations the management personnel made key decisions and kept a running

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[36] John T. Garrity, op. cit.

check on results. Operating management accepted the major responsibility for end results.

One problem in analyzing the organization position of the automatic data processing function is the lack of organizational identity often associated with this function. This problem has partially resulted from the technical specialization often thought to be required for successful computer operation. A more fundamental problem is that for automatic data processing to be applied successfully a corporate wide performance point of view must be taken.[37] This overall support requirement may be hindered by traditional organization structures that place the data processing responsibility in the accounting department by default. Initially, applications of data processing were accounting oriented, but recent advances in data processing systems have broadened their scope to include all information requirements of the business. The aftereffects may be restriction in the successful application of automatic data processing outside of accounting related applications in certain instances.

The purpose of this analysis is to evaluate the department stores in the sample on their integration of the automatic data processing function. Applications are then compared between stores and with the organization

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[37]John Diebold, "ADP - The Still Sleeping Giant," Harvard Business Review, September-October, 1964, p. 60.

position of the data-processing section to determine the line of responsibility for successful performance, system design, and initiation of advantageous use of present equipment.

Inventory Management Applications

The fifteen sample departments in each store are examined to determine the extent and nature of the automatic data processing application in each department. The type of inventory management system, data input methods, and the information report format are also examined. Particular attention is given to the use of data processing in traditional and scientific methods of inventory management.

Application information was determined by direct interview with the data processing manager, unit control managers, and other appropriate executives. Samples of manually prepared worksheets and reports and computer prepared reports were solicited to aid in determining the scope of automatic data processing applications.

Data Processing Application Characteristics

The nature of the inventory management applications of automatic data processing are studied by comparing the use of automatic data processing with the profile of the sample departments. This comparison treats the

operating characteristics of each department with the application of automatic data processing. Department characteristic profiles are developed on the basis of number of resources used, number of merchandise classifications, number of selling locations, number of items being managed, the mode of inventory management, merchandise characteristics, demand characteristics, and buying frequency.

Quantitative measures

This section of the department profile treats the factors that are used to compare the inventory management task in one department with another. These factors were determined on a current basis and for the trend in the past one-to-three year period. Average quantities were requested since seasonal and other variations may occur during the year.

These factors are listed as follows:

1. Average number of items carried in the department.
2. Average number of classifications in the department.
3. Average number of classifications for which sales information is separately reported.
4. Average number of classifications for which price line information is reported.
5. Average number of resources used.

6. Number of selling locations for merchandise purchased by the department.

7. Relationship between the branch manager and the parent store department buyer.

Nature of merchandise

The department profile is in part based on the fashion perishability of the merchandise being managed. The following category descriptions were designed to measure this perishability of merchandise in each department.

1. Merchandise items are fashion perishable and would not normally be carried from one season to the next as their continued popularity is not assured.

2. Merchandise items have a distinct fashion element, although styles do not usually change each season. Style life is varying in length, but the majority of offerings last for more than one season. Most items are partially fashion perishable.

3. Merchandise items are considered staple. Changes in product offerings are made slowly and inventory obsolescence is not a major problem. Merchandise is likely to be in year around demand, although selling peaks occur. A number of these items would be considered "never out" items.

Nature of demand

The department profile includes the pattern of demand for the merchandise inventory being managed in each department. The following categories were designed to give a description of the nature of customer demand.

1. Demand is largely uncertain. Unit sales forecasts cannot be made with an appreciable degree of accuracy because of widely fluctuating demand or because product offerings are new and historical demand data is not available.

2. Demand is somewhat predictable but fluctuates widely from a unit forecast. Demand prediction provides a guideline, although significant variations are expected. Historical demand information for these and similar items provides a basis for estimating future demand.

3. Demand is predictable to the extent that unit sales plans are largely realized. Future demand can be estimated within relatively narrow limits. Product sales have continued over several or more years, thus providing ample data for basing forecasts.

Buying patterns

Finally, the department profile includes the buying pattern for the merchandise being managed in each department. This measure is used to determine the static and dynamic properties of the inventory management problems.

The criteria for determining if a buyer faces a static or dynamic inventory process may not be entirely apparent at the beginning of the merchandising season and often can be determined only after the season is underway. At the beginning of a merchandising season a buyer may plan initial stock requirements with appropriate consideration for the availability of stock that may be reordered. After the season has started, the initial stocks may be replenished once or not at all before pool or manufacturer's stocks are depleted. The operating conditions change involuntarily at this point to a static inventory process.

The following categories were designed to give a description of the buying pattern of the merchandise items.

1. Merchandise items are not or cannot be reordered during the merchandising season. Items may be tested preseason, but after a full stocking committment is made no further orders are received.

2. Merchandise items are reordered once or twice during the merchandising season. Items may be tested preseason, but after a full stocking committment is made no more than two reorders are received.

3. Merchandise items are reordered more than twice during the season as needed. Ordering would include continual purchase of items that are stocked on a year around basis.

Reasons For Using Automatic Data Processing

The reported use of automatic data processing in the management of department store inventories was supplemented by an analysis to provide insight into why a particular application was used. This analysis was made to determine the reason for using automatic data processing where it is used. The analysis treats three main performance attributes associated with automatic data processing. They are: (1) economy of data processing and report preparation, (2) accuracy of data processing and report preparation, and (3) timeliness of data processing and report preparation.

Use rating

Each of the use factors was rated by one of the following degrees to determine the influence on the use of automatic data processing for inventory management.

1. Activity or report not possible without using automatic data processing under normal operating conditions. Suspending the use of automatic data processing would cause interruption of report or activity.

2. Activity or report separately possible, but automatic data processing provides advantages not gained in manual systems.

3. Activity or report independently possible, but automatic data processing is being used. There is no clear advantage of using automatic data processing.

4. Activity or report is being done on automatic data processing equipment as a specific experiment or test. Some parallel checking is being done until test conclusions are developed.

Rating source

The ratings of reasons for using automatic data processing in inventory management were evaluated by the sources of information on which the rating is based. Ratings are gauged by three levels of support for such ratings.

1. Rating determined from analytical studies that directly treated the reason factor being rated.

2. Rating determined from analytical data from which such a determination can be made with reasonable assurance of accuracy.

3. Rating determined largely from a subjective evaluation of performance of the installation based on some data and intimate association with the department and problems of application.

Results Of The Use Of Automatic Data Processing

A significant dimension of the role of automatic data processing, and one of the hardest to measure, is the effect

of its use in inventory management. Many non-inventory decisions such as pricing and promotion policy can affect merchandise management performance. In the aggregate, there was no way to separate the effects of these decisions from the effect of using automatic data processing in inventory management. Within this imposed limitation, the results of data processing use is evaluated by comparing the reported reasons for use with the claimed performance by each department. Departmental performance is evaluated in the following categories: inventory turnover, out-of-stock conditions, and stock age.

Inventory turnover

A high turnover of inventory per se is not necessarily better than a lower turnover in the absence of specific store goals and the supporting criteria for measuring this achievement. Certain restrictions are needed in the interpretation of a desirable rate of inventory turnover. High turnover may result in a high incidence of out-of-stock conditions if the inventory balance is misaligned. High inventory turnover may be achieved at the expense of merchandise selection and lower total sales volume. An increase in inventory turnover is considered favorable where such an increase is obtained without producing undersirable side effects. This type of an increase is accomplished by an improved balance of stock and a reduction in redundant inventories.

A recent publication lists the following factors relating inventory turnover to operating expenses:[38]

1. Warehouse and inventory costs are affected by the length of time the merchandise is stored before sale.

2. Stock handling is influenced by the quantity, and thereby the efficiency of items handled at one time.

3. Store order costs are affected by the quantity ordered on an individual basis.

4. Transportation is influenced by the quantity, and thereby the freight rate of the individual shipments.

This publication also lists the following reasons for variation from normal or desirable inventory turnover.[39]

1. Inadequate stock control information.

2. Outdated inventory control techniques.

3. Inexperienced or understaffed buying or unit control staff.

4. Lack of recognition of turnover importance by merchandising personnel.

5. Excessively broad stocks.

6. Inadequate procedures for locating slow selling merchandise.

7. Lack of department turnover objectives.

8. Lack of inventory budget.

9. Imbalance of sales/inventory relationships in branches.

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[38] How To Analyze A Selling Department (New York: National Retail Merchants Association, 1960), p. 17.

[39] Loc. cit.

From this list of reasons for unsatisfactory inventory turnover it is apparent that improper information reporting and loose control are major causes of problems in the area of inventory turnover.

The use of automatic data processing can materially improve the flow of information and aid in the maintenance of proper inventory turnover as well as providing a basis for improving inventory turnover. The results of using automatic data processing is examined in the sample departments reporting a use to determine its influence on inventory turnover.

Out-of-stock conditions

Closely related to inventory turnover is out-of-stock conditions or conversely the problem of maintaining an inventory position in the merchandise being managed. The direct effect of "stock-outs" is lost sales plus the intangible loss of customer goodwill that can occur.

A recent study indicated that out-of-stock conditions can be substantially greater than indicated by traditional want-slip measures. An International Business Machines analyst reported that a sample of 33,000 shoppers in a large department store had the following out-of-stock experience.[40]

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[40]Archie McGill, op. cit.

Nature of Customer Demand	Customers Reporting Out-of-Stock
Size in preferred item	14%
Size in preferred price line	22%
Size, color, and style in preferred item	22%
Size, color, and style in preferred price line	38%

It is significant that the store prior to the study estimated a maximum of 10 per cent out-of-stock in all categories.

In this study the results of reducing out-of-stock conditions are examined where automatic data processing is in use and such results were known and reported.

Stock age

A measure related to inventory turnover is stock age. Stock age is often expressed as an average or a proportion of inventory in age categories. Automatic data processing based stock age reports need not be used. The use of automatic data processing is examined only as it contributes to the change in stock age.

Collection of Data

Information for the analysis was collected from the department store sample by the use of questionnaires and personal interviews. The questionnaire was the principal

medium used for department data collection and the interview was used to get background information, to assure accuracy, and to followup on the questionnaires where additional information was needed.

Questionnaire

The questionnaire is made up of three parts: (1) an administered section covering background information on the main and branch stores, organization structure, and a description of the data processing installation; (2) a section covering the classification profile; and (3) a section that covers the use and reasons for the use of data processing and the performance measures.

A complete questionnaire form is included in the Appendix.

Background information

The background information section of the questionnaire was used to determine those facts needed to establish operating similarities between the stores in the survey. These characteristics enable a comparable treatment of the use, the reasons for use, and the results of use of automatic data processing in inventory management to be made. Analysis of differences between methods of inventory management--where significant differences occur--is made on the basis of this background information.

Organization structure of the stores including branches was determined. A delineation of this structure is an aid in locating inventory management responsibility. Different organization structures and other variations in inventory management organization are examined. The probe of the organization structure includes the main and branch stores. The departmental responsibility for each classification studied is traced to the parent organization so that inter-store relationships are placed in proper perspective with the inventory management system that is used in each store.

The manufacturer, model, and type of data processing equipment were determined. Also, the relative processing load for the inventory management activities and justification for the application were determined. The purpose for this information is to determine the capabilities and functions of the automatic data processing equipment. Where the overall success of an automatic data processing installation is in doubt, the resulting use of data processing based inventory management techniques may be somewhat impeded. The scope of the questions were meant to probe these considerations.

For each reported use of automatic data processing a rating for accuracy in use, economy in operation, and timeliness of reporting was determined in the manner previously described.

Classification profile

Classification and department profile information was collected for each store in the sample for each of the fifteen classifications selected for the inventory management analysis. The profile, as previously discussed, covers the nature of demand, the nature of the merchandise, and the buying frequency as reported by the responsible department manager. Also, the scope of the inventory management problems as indicated by the number of items or styles on unit control, classification control, and price line control was determined.

Performance measurement

Performance, measured by the methods indicated in the study design section, were determined (where information was available) for the past one to three years of operation in each department. This time period was chosen as the shortest reasonable time frame over which variations in merchandising performance should be indicated. Where changes in department organization had occurred within this time period, an attempt was made to eliminate variations that were not indicative of the total period performance.

Interviews

In all stores interviews were made with the data-processing manager, research director, and manual unit control

manager. The controller, office manager, or his designated representative were also interviewed. Interviews were primarily a supporting method of data collection to the basic questionnaire. In the data collection phase of determining department profile and the results of using data processing, interviews were made on a random follow-up basis to assess response quality. Information concerning the organization position of the data processing operation and the use in the application areas was largely determined by interview.

Interviews were patterned to correspond with the information identified in the study design. The bulk of information gotten from the interviews came from direct questions. Unsolicited comments, however, that pertain to the overall analysis were recorded in all interviews.

CHAPTER IV

AUTOMATIC DATA PROCESSING USE, ORGANIZATION, AND INVENTORY MANAGEMENT APPLICATIONS

This chapter presents findings of the use, organization, and application of automatic data processing. These findings are primarily derived from interviews with department store personnel. Executives from the financial area, research area, and data processing area provided the bulk of the information. Additional interviews with buyers and merchandise managers supplied the remaining information.

At the request of several stores' executives, specific information is not identified by store name. Stores are assigned a number that is used for identification throughout the remainder of the study.

Information covering the use of automatic data processing in inventory management is summarized for four of the five stores examined. One store did not have an inventory management application on its data processing equipment. This store is examined by comparing its inventory management problem characteristics with three cooperating stores of the four stores using automatic data-processing based inventory management systems.

The department stores studied all have an automatic data processing installation. Four of the five stores studied use their automatic data processing capabilities for inventory management. At the time of the interviews all stores reported that either new equipment was on order or they were examining the expansion of the data processing installation. Increased use of automatic data processing in the area of inventory management was anticipated by all stores.

Each store's installation was centered around a medium scale electronic data processer or computer. Three manufacturers of equipment were represented: International Business Machines Company, National Cash Register Company, and the Univac Division of Remington Rand Company. For the purposes for which they are used, the computers are approximately comparable in operation, features, and capacity. Although, variations were present in the methods of data input, peripheral equipment used, and the estimated cost of the installation.

Central Processer

The central processer in each installation is nominally a competitive equivalent in that they are all being offered for the same applications. Two computers, the IBM 1401 and the Univac 1004 are in widespread use. The NCR 304 is only

in limited use and had been replaced by the NCR 315. 56 Exhibit 6 gives comparative data on the average monthly rental and the number of units in operation for each model of computer. The IBM 1401 has the largest number of installations of any computer. The next most popular unit is the Univac 1004. Thus, the study sample includes the two most popular computers in use today.

EXHIBIT 6

RENTAL RATES AND TOTAL NUMBER OF INSTALLATIONS FOR SELECTED COMPUTERS USED IN SAMPLE STORES

Computer	Average Monthly Rental	Total Installations
N.C.R. 304	$8,500	26
I.B.M. 1401	4,500	8,100
Univac 1004	1,900	2,125

Source: "Monthly Computer Census," Computers and Automation, April 1965, pp. 56-57.

Store 1 computer installation

The central processer in the automatic data processing installation in Store 1 is an IBM 1401 computer and associated equipment. The computer uses 80 column punch cards for input and 120 column print-out forms for output. Information not readily available in 80 column punch card form is converted in one of three ways:

1. Written records are manually key punched into 80 column punch cards.

2. Twenty-four column Kimball print punch tags are connected to punch cards by three Kimball tag readers connected to an IBM key punch machine.

3. Five channel punched paper tape is converted to 80 column punch cards on an IBM tape-to-card converter.

Kimball tags are detached from merchandise at the point of sale and provide an immediate record of item movement. Three tags are later recorded on one punch card. Dollar sales information by classification from the branch store is collected with a punched paper tape recording NCR Sales-Tronic register. The punched paper tape is forwarded each day to the data processing department where it is converted to punched cards for entry into the computer. Store 1 between 1966 and 1967 plans to install an optical scanner that can "read" sales register journal tapes printed in a stylized font. This conversion will replace the punched paper tape input mode of data recording from sales registers.

Store 2 computer installation

The central processer in the Store 2 installation is an NCR 304 computer and associated equipment. This computer normally uses a five channel paper tape for input and a 120 column print-out for output. Currently, an improved

model computer, a NCR 315 is being installed, but at the time of the interviews was not totally operational. Data not available in punched paper tape form is converted in two ways:

1. Twenty-four and twenty-nine column Kimball print-punch tags are converted to paper tape on an Ohr-Tronics tag-to-paper tape converter.

2. Written information is punched into five channel paper tape.

Punched paper tape from NCR Sales-Tronic registers is used for direct input to the computer. In limited operation is an optical scanner input to the NCR 315 computer. This device "reads" sales register journal tapes and directly transfers the information into the computer. When totally operational, the NCR 315 will primarily use optical input mode.

Store 3 computer installation

The central processer in Store 3 is an IBM 1401 computer and associated equipment. The computer uses the same input and output mode as the installation described as used by Store 1 and is comparable in all other features. In addition to branch store locations, NCR Sales-Tronic registers are used in the main store departments where interselling between departments is prevalent and in outpost sales locations during special sales events.

Store 4 computer installation

The central processer in Store 4 is an IBM 1401 computer and associated equipment. The installation is similar to that in Store 1 with the exception that point-of-sale information is recorded by twenty and twenty-five column Dennison print-punch tickets. After collection at the time of sale, these tickets are converted to 80 column punch cards with a Cummins Data Read coupled to an IBM 521 card punch.

Store 5 computer installation

The central processer in Store 5 is a Univac 1004 computer and associated equipment. Input is 80 column punch cards and output is in a variety of forms. In this installation inventory management and related uses of the computer are not made. No provisions are available for converting print-punch tags or for direct input of punched paper tape from recording sales registers.

The computer is used in specialized applications as indicated:

Time	Application	Output
25%	Printing address labels for direct mail promotion and catalog mailing.	Mailing Label
25%	Printing statement headings for monthly customer billings.	Addressed Statement
50%	Analysis of mail order response by customer and address	120 Column Print-out
100%	Total time used	

The store organization structures of the five stores studied vary somewhat in the number of functional divisions that reported to the chief executive officer of the store. There was also variation in the organization location of the data processing department, the systems research department, and the branch store managers. Some difference is attributed to store size, but the variations in the span of management at the vice-president level reflects the store's management philosophy. A fundamental relationship between the span of management and the levels of management is apparent. Stores with a low span tend to have a larger number of levels in the organization. Stores with a high span tend to have fewer levels.

The location of the data processing function and the manual inventory control section is partially determined by the overall organization configuration, however, certain organization characteristics are identified.

Organization Charts

An organization chart for each of the five stores studied is shown in Exhibits 7 through 11. As requested, specific information is not identified by store name. Organization charts were abbreviated to eliminate superfluous detail not needed in the following analysis. These

EXHIBIT 7: ORGANIZATION CHART, DEPARTMENT STORE 1

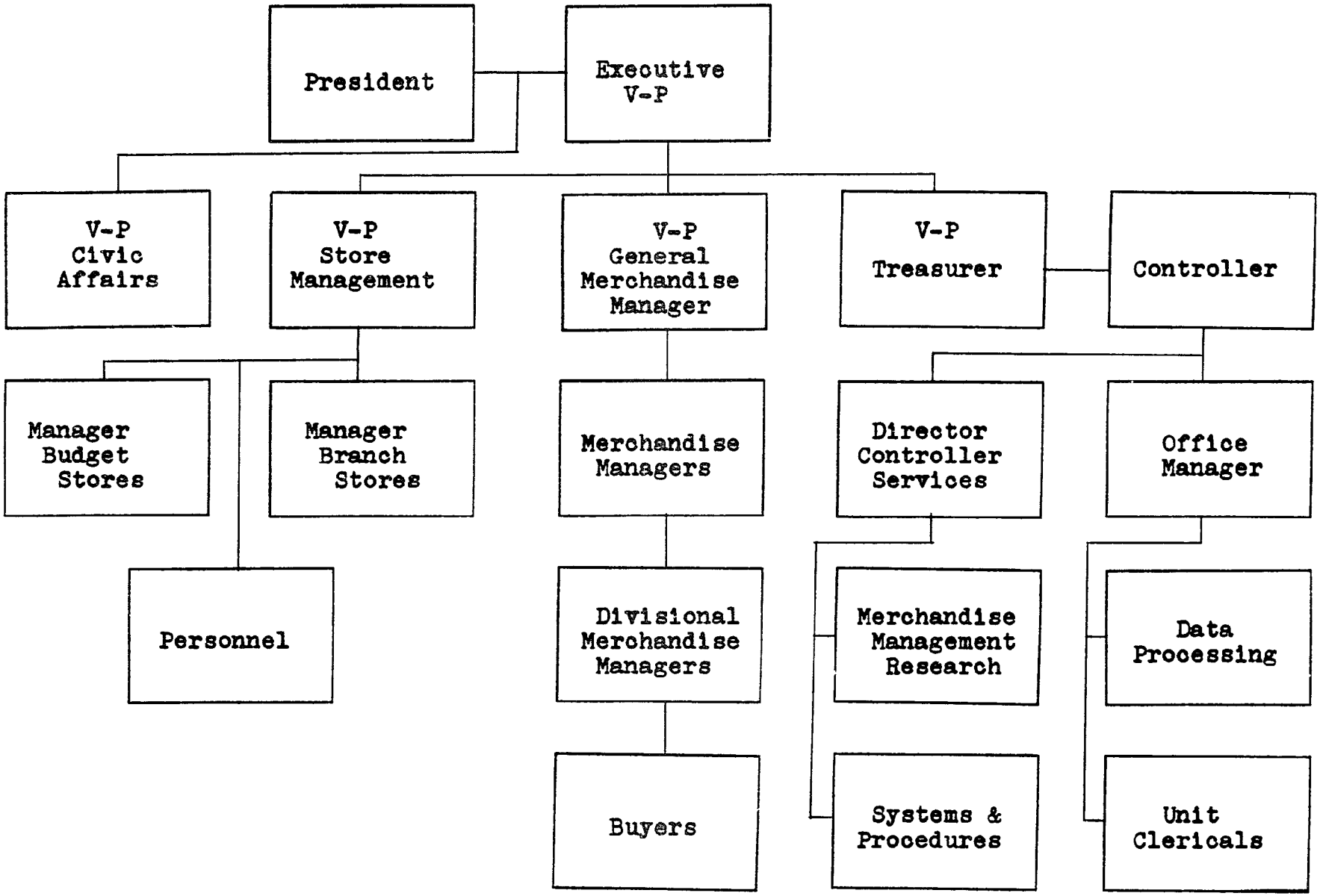


EXHIBIT 8: ORGANIZATION CHART, DEPARTMENT STORE 2

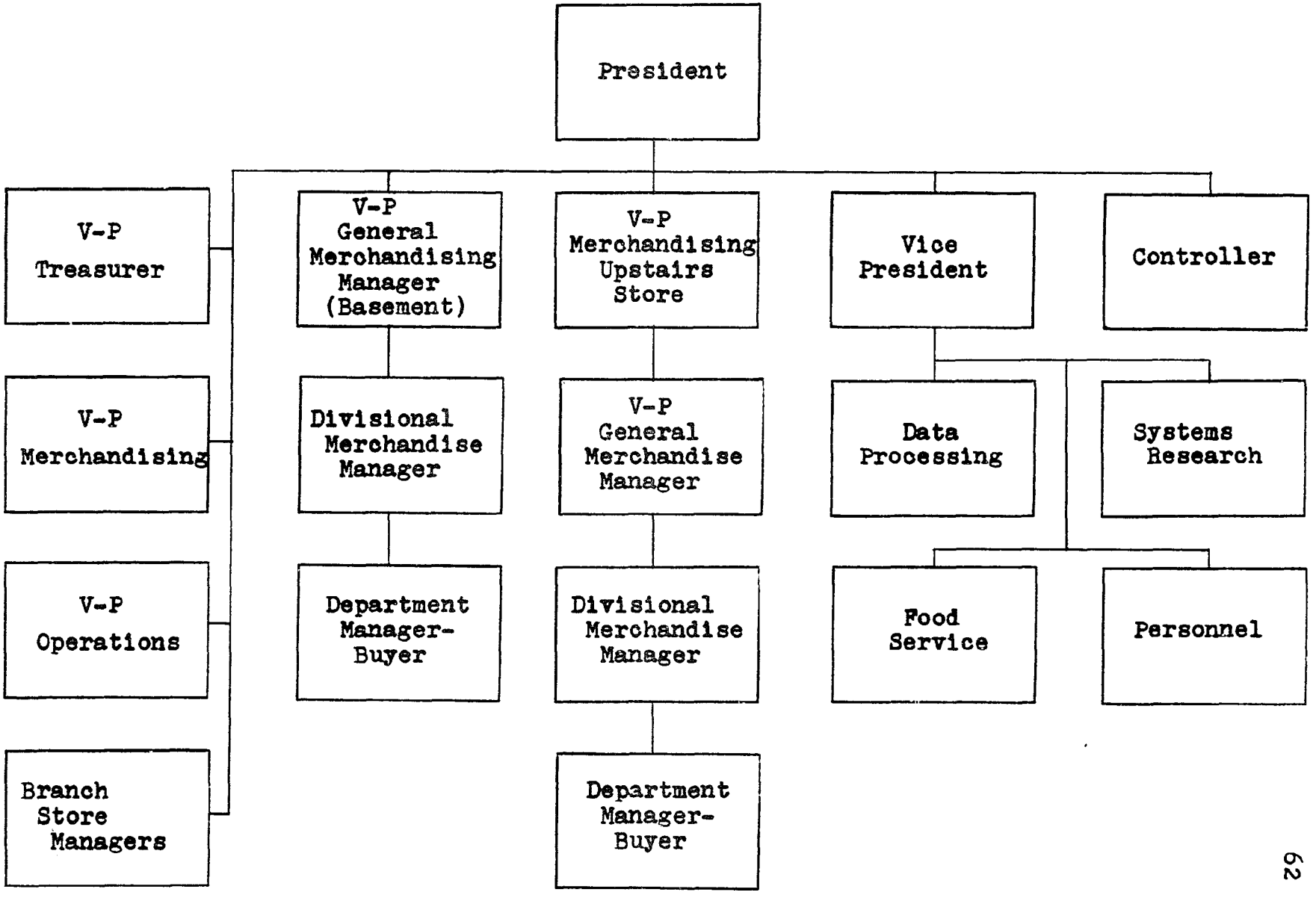


EXHIBIT 9: ORGANIZATION CHART, DEPARTMENT STORE 3

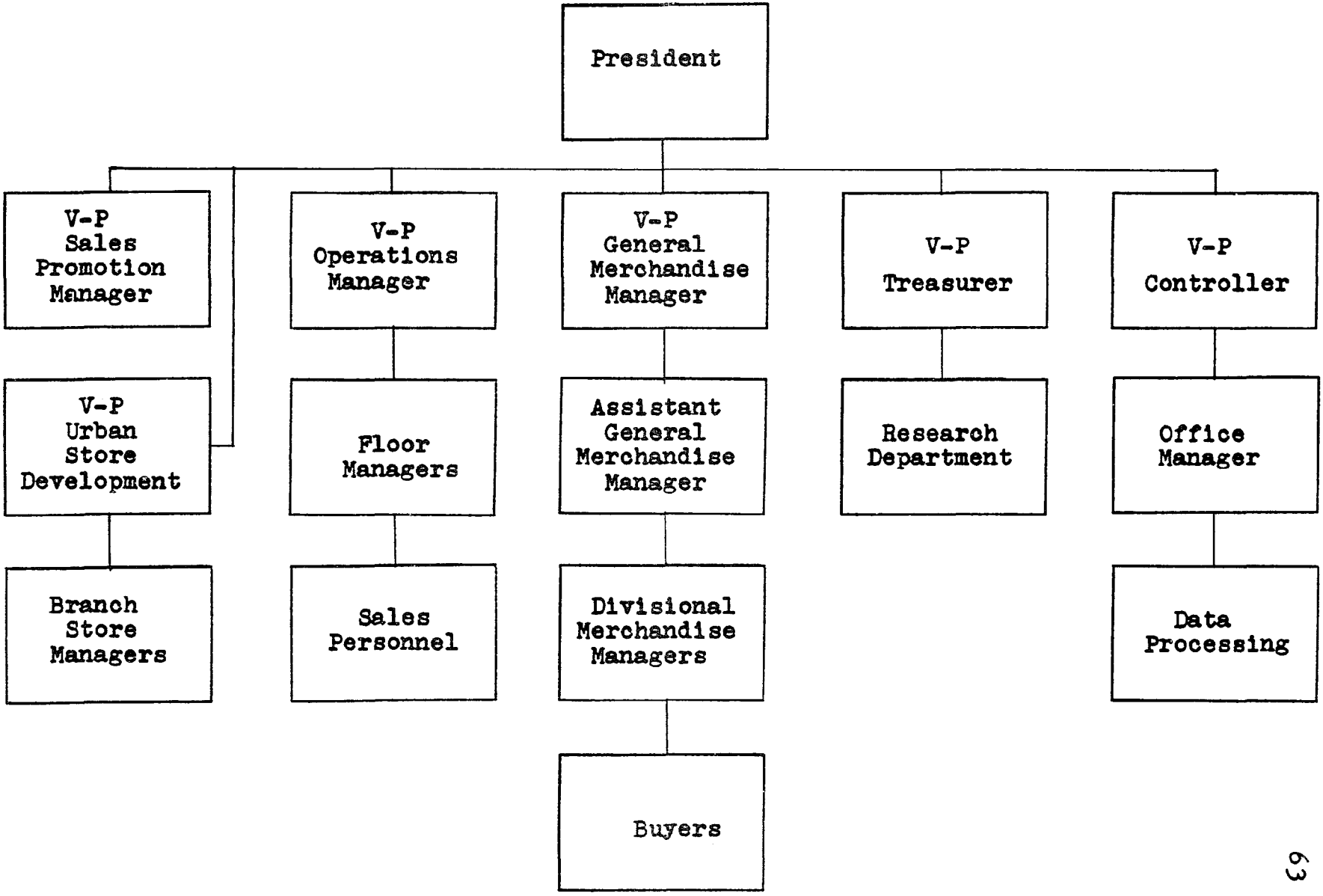


EXHIBIT 10: ORGANIZATION CHART, DEPARTMENT STORE 4

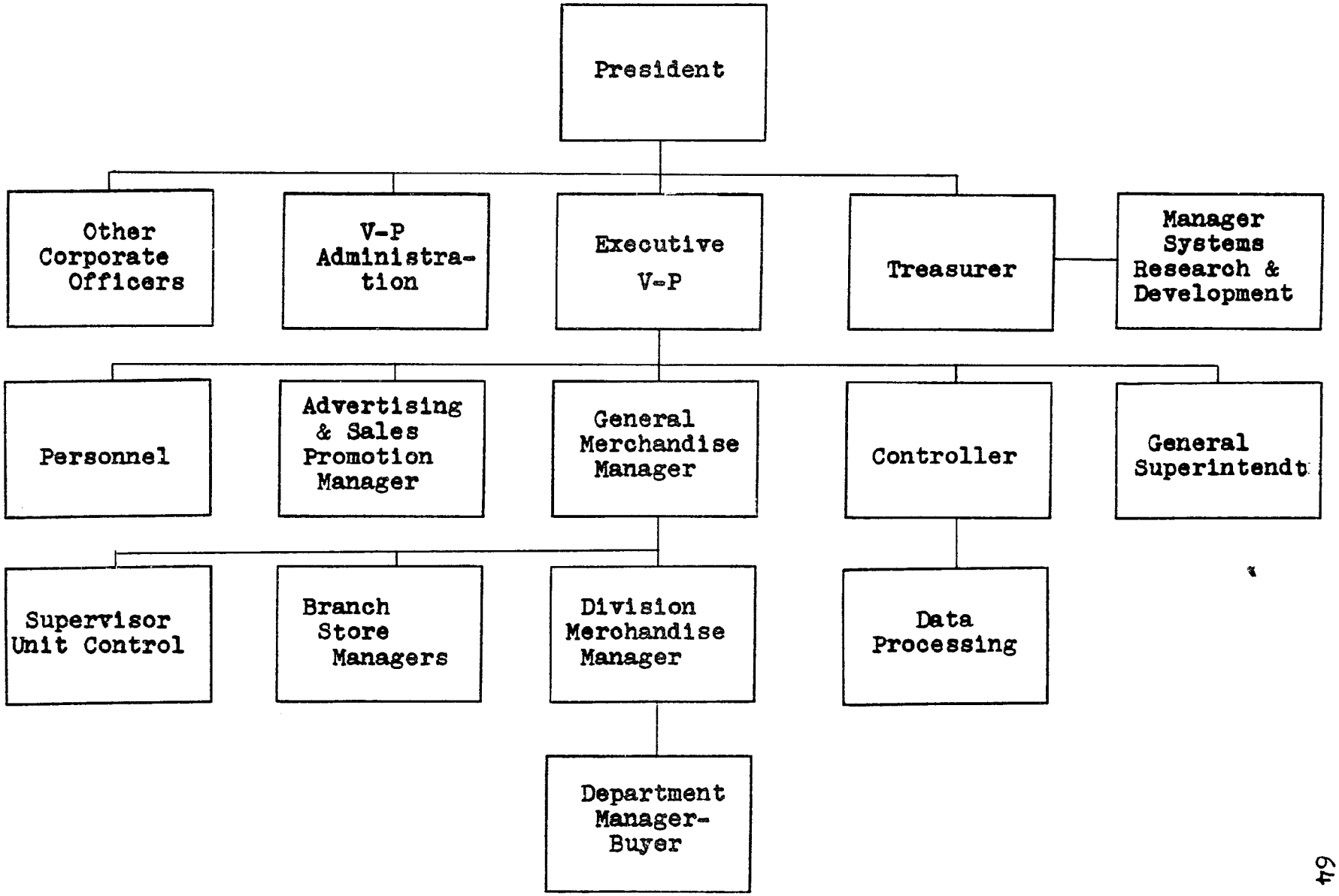
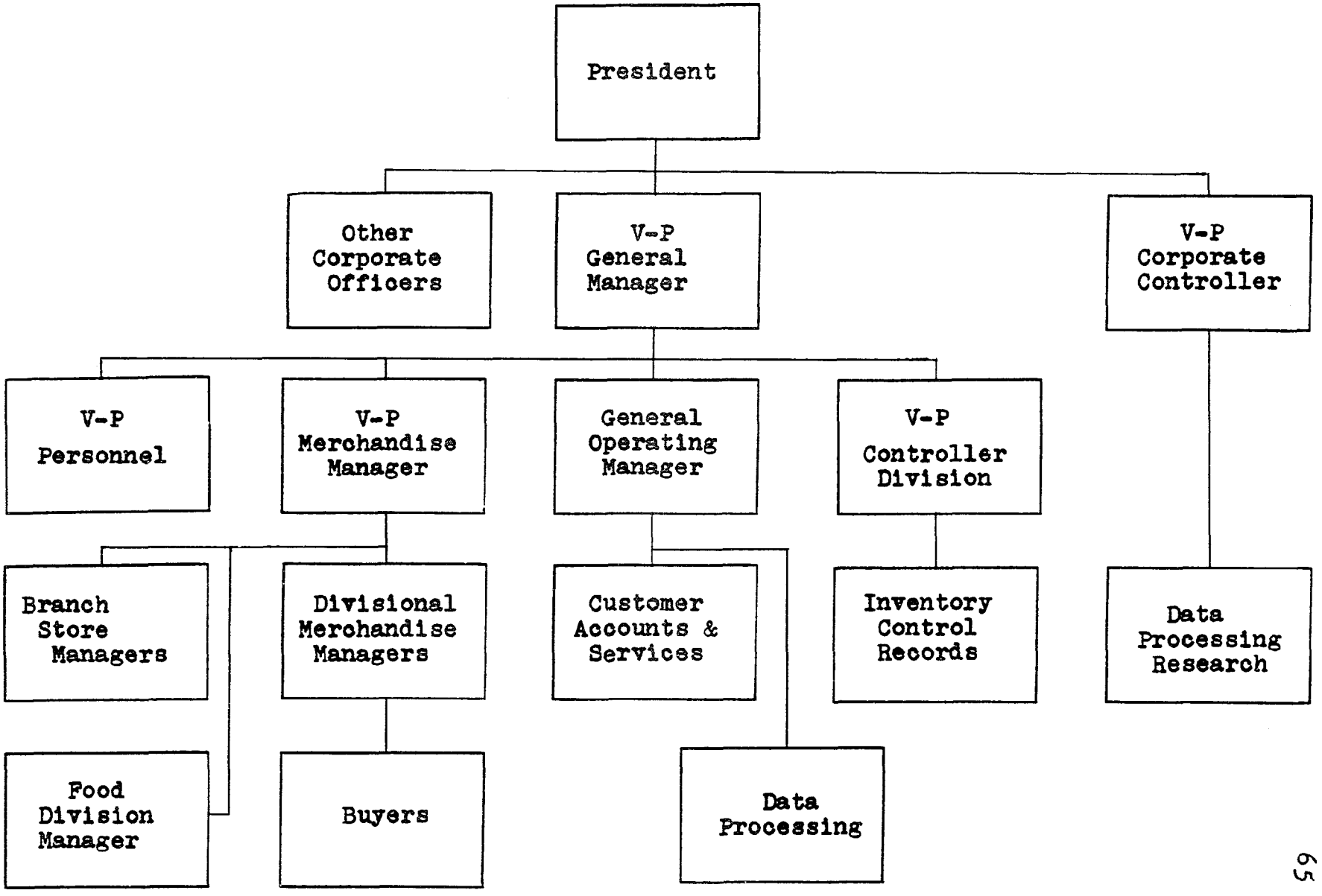


EXHIBIT 11: ORGANIZATION CHART, DEPARTMENT STORE 5



charts show the data processing department, the merchandising organization, and the systems research department. The centralized manual unit control departments are shown for stores that have this department.

Data Processing Departments

In all of the stores visited, the data processing finction was organized into a separate department with a designated manager. The data-processing manager reported to the controller in Stores 1, 3, and 4. In Store 1 the controller reported to the treasurer, in Store 4 to the executive vice-president, and in Store 3 the controller reported directly to the president. In the remaining two stores, the data processing manager reported to a separate vice-president in Store 2 and to the general operating manager in Store 5.

It is significant that in three stores the financial division is the preferred location of the data processing department. One factor favoring this organization position is that the bulk of the data processing load (except inventory management requirements) is financial in nature. The location of the data processing department in the financial division is not inherently the best placement for inventory management needs. However, the basis for assigning an activity to the department that uses it the most is an accepted practice.[41]

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[41]Harold Koontz and Cyril O'Donnell, Principles of Management (New York: McGraw-Hill, 1964), p. 252.

The organization position of the data processing department did not appear to create an under-utilization of automatic data processing in inventory management. In all sample stores, the data processing manager and controller were actively interested in providing better inventory management information to the merchandising divisions. The most frequently mentioned drawback to more widespread use of automatic data processing was the design of a system that would be more useful to the buyer and would provide off-setting savings to cover its cost.

Manual Unit Control Departments

In no store visited had the use of automatic data processing equipment in inventory management completely eliminated the need for manual unit control. To some extent, activities of manual unit control were present in all of the merchandising departments that used unit control. In Stores 1 and 4 the manual unit control activities were centralized. That is, a separate department processed the inventory management information for many merchandising departments. In Store 1 the manual unit control department reported to the financial division. In Store 4 it reported to the merchandising division. In both stores data processing based inventory management systems replaced work historically done by the central manual unit control department. In Stores 2 and 3 the complete inventory

management record system was maintained within the individual merchandising departments. In these departments the computer output was often used to prepare manual reports. In contrast, where inventory management information originated from a centralized unit control department, the computer output was usually used in final form.

Systems Research Departments

The systems research departments in the store sample, like the data processing departments, were involved with many other activities than inventory management and were most often attached to the financial division of the store. The designation systems research department did not always indicate the presence of a research effort in either inventory management or related systems. Also, the size of the departments varied among the stores from four men full-time in Store 1 down to one man part-time in Store 5. With the exception of specific inventory management projects, the data processing managers seemed to be more actively working on problems of inventory management than the systems research departments. The systems research departments in the sample stores were generally involved in widely varied system planning such as accounting and audit procedures, receiving and marking controls, forms layout, and equipment studies. In no store did the systems department have a major part of its effort allocated to inventory management problems and procedures.

Data Processing Applications

In examining the use of automatic data processing in inventory management, all uses of the stores' data processing installation were considered. As a measure of significance, the applications are ranked by the processing times for each category. This type of analysis provides perspective on the relative usage ranking of inventory management with other applications. It is noted that there may not be a direct connection between the rank of data processing use and the importance or value of the processing job. In the long run, however, the cost of processing inventory management information by automatic means must be offset by savings or better results.

Applications Ranked

The applications ranked are grouped into seven main functional areas plus an eighth miscellaneous one. The applications are then ranked by their proportion of the total data processing load. Rankings are shown in Exhibit 12. Rank one indicates the most use and rank eight the least.

Two of the five stores had data processing applications in all categories listed. Store 5 used its data processing installation only for maintaining a mailing list and printing address labels.

EXHIBIT 12

DATA PROCESSING APPLICATIONS RANKED BY USAGE
FOR SELECTED DEPARTMENT STORES

Application	Store				
	1	2	3	4	5
Inventory Management	1	4	2	1	*
Accounts Receivable	*	1	1	2	*
Sales Audit	4	2	3	5	*
Accounts Payable	3	*	5	4	*
Payroll	2	3	4	3	*
Personnel Records	5	5	6	7	*
General Accounting	*	*	7	6	*
Other Miscellaneous Uses	6	6	8	8	1

*Indicates no application.

Source: Interviews.

The office manager of Store 1 estimated that when accounts receivable are processed in the near future this activity will require greater processing time than the present inventory management load. Thus, inventory management will be lowered to rank two. Inventory management will only change in relative importance since obviously the inventory management application will be unaffected. In respect to the overall use of data processing, however, inventory management will be a less important use as measured by processing time.

Inventory Management

The data processing usage rankings show no clear pattern of importance among the stores studied. On an overall basis, inventory management appears to be second in usage rankings only to accounts receivable. Store 4, with inventory management ranking first, had a larger number of departments using automatic data processing for inventory management systems than the other stores in the study. Its data processing output was designed to be comprehensive in nature and the buyers tend to use it in its received form. By contrast, Store 2 maintained clerical help in each department served by data processing to manually process inventory management reports and handle related details. The data processing department processed only data that can be machine converted. Print punch tags

that could not be "read" were returned to the originating department where additions and corrections were made manually to the computer reports. The computer reports were then used by the clerical personnel to prepare traditional inventory management reports. There was no indication that the buyer normally used the computer reports directly as was often done in other stores. Store 3 and ultimately Store 1 have inventory management ranked second.

The number of departments served and the scope of inventory management processing appear to influence the usage ranking. In spite of variations occuring in its ranking, inventory management is an important application of data processing. In addition, all of the executives interviewed expected future increases in the inventory management processing load.

Exhibit 13 is a summary of the computer systems, data processing organization location by management level, and the applications of data processing for each of the sample stores. The organization level is indicated by the chain of command between the data processing department manager and the chief executive officer for each sample department store.

EXHIBIT 13

SUMMARY OF COMPUTER SYSTEM, ORGANIZATION LOCATION, AND APPLICATIONS OF AUTOMATIC DATA PROCESSING DEPARTMENTS FOR SAMPLE DEPARTMENT STORES

Store	Computer System	Data Processing Department Reporting Level	Applications	No Applications
1	IBM 1401	Office Manager-Controller	Inventory Management Accounts Receivable Sales Audit Accounts Payable Payroll Personnel Records General Accounting Other Miscellaneous Uses	Accounts Receivable General Accounting
2	NCR 304-315	Vice-President		Accounts Payable General Accounting
3	IBM 1401	Office Manager-Controller		-
4	IBM 1401	Controller		-
5	Univac 1004	General Operating Manager	Address Labeling, Bill Heading, Mail Order Analysis	No other applications than indicated.

Source: Exhibits 7 through 12.

Automatic Data Processing Based Inventory Management

In this section, the departments using automatic data processing, the basic inventory management system used, the typical applications and scientific inventory management applications, and future uses are examined. In the inventory management applications analysis basic or common methods of using automatic data processing are treated. This categorization of inventory management applications is helpful and simplifies the study since differences from the basic systems observed in each sample store's operation are minor. Adaptation and tailoring the automatic data processing based system to fit individual store's methods and techniques accounts largely for the noted differences.

Departments Using Automatic Data Processing

Exhibit 14 lists the methods of processing inventory management used in the sample departments. The use of automatic data processing in these departments followed a distinct pattern. Automatic data processing applications were concentrated in the ready-to-wear apparel areas. Of twenty sample departments that used data processing, three were not classified as ready-to-wear apparel. Two shoe departments were using automatic data processing in Store 4,

EXHIBIT 14

METHOD OF PROCESSING INVENTORY MANAGEMENT INFORMATION BY DEPARTMENT
SAMPLE FOR SELECTED DEPARTMENT STORES

Department Sample	Store 1	Store 2	Store 3	Store 4
House Dresses	ADP	ADP	ADP	ADP
Women's Better Shoes	Manual	Manual	Manual	ADP
Women's & Misses' Dresses	ADP	ADP	ADP	ADP
Formals & Bridals	Manual	Manual	Manual	ADP
Better Blouses	ADP	ADP	ADP	ADP
Women's Budget Shoes	Manual	Manual	Manual	ADP
Negligees & Robes	ADP	ADP	ADP	Manual
Men's Furnishings	Manual	ADP	Manual	Manual
Blankets	Manual	Manual	Manual	Manual
Corsets & Brassieres	ADP-test	Manual	Manual	Manual
Hosiery	Manual	Manual	Manual	Manual
Linens	Manual	Manual	Manual	Manual
Cosmetics	Manual	Manual	Manual	Manual
Drugs & Drug Sundries	Manual	Manual	Manual	Manual
Housewares	Manual	Manual	Manual	Manual

Source: Store Interviews.

and Store 1 was conducting an inventory management test in the corsets and foundations department. In many departments automatic data processing was not used for all items sold in the department. Accessories and related items were often not covered by the inventory management system. Inventory of these items was small compared with the departmental total, sales were usually complementary, and merchandise inventory was satisfactorily managed on a manual basis.

Inventory Management Systems

The method of inventory management used in the sample departments is shown in Exhibit 15. The systems are designated as perpetual or periodic. Perpetual inventory systems use point-of-sale recording to determine product movement and maintain an up-dated book inventory record of items sold and in stock. Periodic inventory systems use rotated stock counts as a basis for recording sales movement and on-hand inventory position. Both systems may be used to determine sales rates and inventory position, but the methods differ.

The perpetual inventory systems in the sample are used almost exclusively in the apparel departments while the periodic inventory management are used in the staple merchandise departments. By comparing the inventory management systems with the applications of automatic data

EXHIBIT 15

METHOD OF INVENTORY MANAGEMENT BY DEPARTMENT SAMPLE FOR SELECTED DEPARTMENT STORES

Department Sample	Store 1	Store 2	Store 3	Store 4
House Dresses	Perpetual[a]	Perpetual[a]	Perpetual[a]	Perpetual[a]
Women's Better Shoes	"	"	"	"[a]
Women's & Misses' Dresses	"[a]	"[a]	"[a]	"[a]
Formals & Bridals	"	"	"	"[a]
Better Blouses	"[a]	"[a]	"[a]	"[a]
Women's Budget Shoes	"	"	"	"[a]
Negligees & Robes	"[a]	"[a]	"[a]	"
Men's Furnishings	Periodic	"[a]	Periodic	Periodic
Blankets	"	Periodic	"	"
Corsets & Brassieres	Perpetual[a]	"	"	"
Hosiery	Periodic	"	"	"
Linens	"	"	"	"
Cosmetics	"	"	"	"
Drugs & Drug Sundries	"	"	"	"
Housewares	"	"	"	"

Note: [a]Automatic data processing used in inventory management., Source: Store Interviews.

processing, it was found that all applications of data processing were in the sample departments using perpetual inventory systems.

Typical Automatic Data Processing Use

In eighteen of the twenty sample departments using automatic data processing for inventory management, the use followed two well defined patterns. In one case, the computer was used to summarize item movement data into reports that are then sent to the departments. In the second case, the computer was used to summarize item movement data and maintain a book inventory record for each item or style under control. In the first application, the computer was used as little more than a tabulator. But in the second, capabilities of data storage, random access, and file updating were needed.

The primary form of data input to the computer in both applications was print-punch tags. Variation occurred in the data processing requirements and the report content.

Data input

The item or style movement data input mode to the computer in all sample inventory management applications is print-punch tags. Although similar, each department partially adapts the information content of the print-punch tags to its individual needs. The minimum information

capacity input used is a twenty column tag and the maximum is a twenty-nine column tag. This means that between twenty and twenty-nine digits of information can be recorded for each item that is ticketed. The print-punch tags usually contain the following information when it is pertinent:

Department
Classification
Style number
Manufacturer's code
Store code
Price
Size
Color
Item characteristic (may be fabric, silhouette, neck, number of pieces in ensemble, or other information)

A typical twenty-four column print-punch tag is set up as follows:

Number of Digits		Information
3		Department in store
3		Classification
2		Store (branches and main)
5		Style
2		Color
5		Price
4		Vendor
24	Total	

Twenty column tags are used when color information is not needed. Twenty-nine column tags are used when additional item characteristics are recorded or additional digits are used. Multiple part print-punch tags are used in those departments where book inventory is computer based and receiving information and customer returns must be inputed

to the computer. As many as five parts are used on a single tag for the following purposes:

Part	Purpose
(1)	Receiving record
(2)	First sale record
(3)	Return record
(4)	Second sale record
(5)	Item attachment stub

A supplementary form of data input to the computer is punched paper tape from recording sales registers. This type of sales register is commonly used in the sample stores' branches and basement division, and is in limited use in the upstairs stores. Depending upon the data processing capability in each store, the information on the punched paper tape is transferred to punch cards for computer input or inputed direct. Information for each sale is limited by the sales register capacity and usually contains the following:

Department number
Classification number
Price
Sales clerk code
Cash, charge, return, or refund code
Register number (provides store and location information)

Of the above sales record, dollar sales by department, classification, and location is the usual extent of pertinent information for inventory management. The balance of the data is used for sales audit, clerk evaluation, and other management uses.

All remaining inventory management information including price changes inputed to the computer is key punched into

cards or paper tape. This mode of input is not limited to a tag field or sales register capacity and is flexible enough to accommodate all needed information.

Information processing

The information processing requirements for each sample store depended upon the scope of the computer based inventory management system. The simplest processing requirements were those needed to create item or style movement reports. The next most complex processing requirements were those needed to maintain book inventory records. The most complex requirements were those needed for scientific inventory management applications. All of the sample stores that used automatic data processing for inventory management had the computer capability for all three types of data processing.

Computer programs used to create item or style movement reports are commonly described as sort-list programs. Incoming item/style information is sorted and summarized into a listing showing main store and branch locations for each department being controlled. The listing can be made for each category of information used. For example, sales may be listed by item/style, price or price line, color, vendor, and item characteristics. In addition, the computer can be used to maintain an internal record of past sales. Thus, sort-listing can include historical and current movement data in a comparative format.

The computer program for maintaining book inventory records is more elaborate than the sort-list program and requires receiving, transfer, and customer information in addition to item/style sales data. An internal record is kept for each item or style under control and is updated at predetermined intervals. Reports are produced from this internal file that typically show current inventory at main and branch locations, merchandise on-order, current sales, sales-to-date, and sales for several prior periods.

The automatic data processing program for the scientific inventory management applications is discussed in a later subsection.

Reporting

The reporting mode in all the sample stores was the ubiquitous 120 column computer print-out sheet. A specific format was set for each type report prepared that did not always use the full 120 columns. The only limit imposed on this format is the 120 digit limit per report line. Column headings may be preprinted on the forms or computer printed at the time of report preparation. Most reports used computer printed headings as report format changes were made from time-to-time. Thus, computer prepared reports were flexible and could be changed with minimum effort. Typical reports are briefly described:

1. Sales Report. This report contains sales information for a specified period of time by units and dollars categorized for main and branch stores. Sales history in the form of past period sales, period-to-date sales, and markdowns is also shown in the majority of reports.

2. Price Line Report. This report contains dollar sales information by price line for each department and classification. Breakdown may be shown for branch and main store and total sales by classification.

3. Inventory Report. This report shows stock on-hand by item, classification, and department at branch and main store locations.

4. Item Characteristics Report. This report shows unit sales by item characteristic for department, classification, and branch and main store. Usual characteristics reported are color, size, fabric, silhouette, neck, number of pieces in ensemble, and other related data. The coverage of this report is normally limited and its frequency of preparation tends to be on an "as requested" basis by each department.

Variations and combinations of the above reports were found among the stores and departments, however, the basic information is the same. These reports are similar to the ones prepared by predecessor manual systems and the main difference between the computer and manual reports is the increased frequency of preparation and the scope of coverage.

Additional reports used in scientific inventory management systems are discussed next.

Scientific Inventory Management Practices

The designation scientific inventory management has been used to describe almost every inventory management system that relied on numerical rather than visual control of inventory. Numerical representation of inventory is neither a new nor complicated process. Adapting manual record systems to automatic data processing does not alone create a scientific system.

In establishing the use of scientific inventory management techniques, a criteria of statistical forecasting and related techniques was used. That is, the inventory system had to use a mathematical statistics approach in determining demand forecasts, inventory levels, and recorder points. When collecting information, distinguishing between traditional techniques and scientific inventory management did not pose a problem. The uses of scientific techniques were limited in application and were either still being run as a test or had been tested and discontinued. The applications of scientific inventory management being used by the sample stores grouped into two categories: those designed for staple merchandise management; and those designed for fashion apparel management.

The staple merchandise system uses a periodic type inventory management approach and the fashion system uses a perpetual type inventory management approach.

Fashion merchandise management

Two stores were running scientific inventory management programs on a test basis in fashion merchandise areas. From questions directed to the stores' research and data processing departments, the results of these tests were mixed. The managers interviewed emphasized that a substantial problem exists in getting accurate information into the data processing system before any application would work well. Several managers felt that certain tests were unsatisfactory because input data could not be controlled rather than the lack of merit of the basic system.

The smoothest running test was selected as an example of the potential use that can be made of scientific inventory management techniques combined with automatic data processing in the apparel departments.

Selected example

Store 4 has been running a scientific inventory management system in its women's and misses' dress department since late 1964. During this time problems of input data accuracy, report format, and buyer resistance have been largely overcome. This system is one that has been written

about in many department store publications under the name "Style Life Inventory Management."

Features of system. The principal feature of this system is the estimate of an item's style life. That is, the number of days the style (excluding size and color) can be sold at full retail. Different styles have different life estimates based on historical style life performance. Two significant outputs of the "SLIM" system are:

1. The action coding of all styles on a three times a week schedule.

2. A suggested reorder quantity for merchandise that is exceeding sales expectations.

All styles under control are rated with an action code that is determined by the rate of sale for a specific period of time. The codes are as follows:

1 = Rate of sale is much greater than anticipated--potential reorder.

2 = Rate of sale greater than anticipated.

3 = Rate of sale less than anticipated.

4 = Rate of sale is much less than anticipated--consider markdown.

For all styles coded 1 and 2 a suggested reorder quantity is automatically determined and indicated on the buying guide report. Reorder recommendations are based on the following pertinent information:

1. Actual rate of sale to-date.

2. Expected rate of sale.

3. Remaining days of style life.

In this particular application, the buying guide report is used in conjunction with three other major reports that are developed by traditional methods. These reports are the store management guide, a cumulative sales summary of each style; a price and class analysis; and a unit characteristic analysis. The latter report lists a summary of unit sales by neck, body, sleeve, pattern, fabric, and the number of pieces in the ensemble.

System performance. Exhibit 16 is a summary of the buyer's appraisal of the "Style Life Inventory Management" system.

Favorable comments by Store 4 executives were supported by the department buyer. The performance improvement was attributed to these factors:

1. Additional information is available that was not available from manual methods of reporting.

2. Greater accuracy of information (providing the input information is reasonably accurate).

3. Faster reporting of sales and stock information.

4. A better breakdown and summary of sales and stock information.

The buyer indicated that no improvement occurred in inventory turnover and item movement identification for women's dresses because these factors were not a problem under the manual system. Thus, in all categories under study where improvement was possible, some improvement has been experienced.

EXHIBIT 16

STORE 4 WOMEN'S AND MISSES' DRESS BUYER'S EVALUATION OF STYLE LIFE INVENTORY MANAGEMENT SYSTEM TEST

Performance Factor	Woman's Dresses	Misses' Dresses
Out-of-stock Conditions	5% - 10% reduction in the number of items out-of-stock during the season.	5% - 10% reduction in the number of items out-of-stock during the season.
Inventory Turnover	No change.	Over 10% increase in the sales to beginning of month inventory ratio.
Stock Age	0% - 5% reduction in the average time merchandise is in inventory.	0% - 5% reduction in the average time merchandise is in inventory.
Identification of Item Sales Movement	No change.	Over 10% more items identified as selling faster or slower than expected.
Requirements Planning	Moderate Improvement	Moderate Improvement
Control of Branch Stocks	Substantial Improvement	Substantial Improvement

Source: Automatic data processing questionnaire.

The collective appraisal by the store's executives interviewed was that style life inventory management is a valuable contribution. They also believed that the most economical and practical way of preparing these reports was with automatic data processing equipment.

Overview of test. The favorable results of a continued test in one department in one store is significant evidence that automatic data processing can provide capabilities that facilitate scientific inventory management. No one believes that this system is a panacea for all inventory management applications, but rather a valuable tool that is valid for many ready-to-wear applications.

Staple merchandise management

The executives of three of the stores in the sample acknowledged the test of a statistical forecasting and automatic reorder system in their staple merchandise areas. At the time of the interviews, all stores had discontinued running the tests and had not adopted the system. There was general agreement of the reasons for discontinuing the tests--the system failed to improve upon or often equal the buying performance normally achieved by traditional techniques.

Features of system

The main feature of the systems tested by the three stores is a computer program that estimates expected sales

rates from historical sales data for categories of merchandise. Based on demand variation, the level of inventory is statistically determined that would result in a ninety or ninety-five per cent level of customer service.[42] Rotated stock counts are taken at predetermined intervals and an order for merchandise is automatically determined that restores the inventory to the prescribed level. Theoretically, this type of staple system should have been highly effective. In practice it was found to be unreliable by the stores' executives when compared with their performance objectives. The main reason given was that sales rates were too variable to allow the inventory position to remain unsupervised between stock counts.

Problem of unusual sales rates

The data processing manager of Store 2 indicated that in his experience many departments selling merchandise considered as staple experienced some abnormal sales variations. These variations are sometimes called "freak sales" and occur when customers buy an extraordinary quantity of a certain item at one time.

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[42]Other levels of service can be used by setting reserve stock quantity at a different number of standard deviations from the mean demand. In this example a 90% level of service requires a 1.28 standard deviation back-up and a 95% level of service a 1.65 standard deviation back-up stock quantity.

The most vocal spokesman against this type of staple inventory management system was a divisional merchandise manager at Store 1. He is responsible for several departments that conducted a test of a statistical based inventory management system. The essence of his criticism is that staple merchandise sales rates cannot be accurately described statistically. In his experience, the out-of-stock conditions increased--not decreased--when using this system. It was also found that sales rates of individual items of a staple nature are very sensitive to competitive promotion and to the store's promotion.

Results of tests

In the three department stores in the sample that acknowledged testing a statistically based staple merchandise inventory management system, the system was unable to cope with "freak sales," sales variations due to promotion, and was unable to reduce out-of-stock conditions. On the basis of the test results, all trials were ultimately terminated by the stores.

Currently, there is no indication that suggests a system of this type is being planned on a permanent basis by any of the sample stores. In this application, automatic data processing is of little value since the basic system has not met suitable performance objectives. Further refinements and experience with a staple inventory

system may in the future prove acceptable to the sample stores. Past tests, however, do not give encouragement to the possibility of wide-spread use of this approach to staple inventory management.

Future inventory management applications

With the expansion of full-line branch stores, department managers in the "big ticket" areas were unable to accurately determine their in-stock position from multiple locations. Often, merchandise was in-stock but could not be located in the warehouse.

At the time of the interviews three of the five stores were actively developing an inventory management system for major appliances and furniture. This system will be used for items that are normally stored in a separate warehouse and delivered directly to the customer upon sale; sales being made from floor samples in the main and branch store locations. Basically, two problems will be solved with these systems: (1) accurate and timely knowledge of in-stock position on all items and (2) the warehouse location of an item.

At each selling location a data transmission device will be connected to the central computer. At any time, a sales clerk will be able to enter the stock number of an item and get an immediate answer on the current in-stock position of that item. At the time of sale, an entry

will be made to the computer which automatically adjusts the inventory record and prints a delivery notice at the warehouse complete with the item's warehouse location and customer's name and address.

CHAPTER V

PROFILE OF DEPARTMENT CHARACTERISTICS AND OPERATING ENVIRONMENT

The number of selling locations, branch store operations, and department characteristics as they relate to inventory management are examined in this chapter. The number of inventory management locations including branch store and outpost departments within the main store are also examined as is the branch store manager's responsibility in the inventory management process. The sample departments are studied on the basis of their merchandise characteristics, customer demand, buying frequency, number of resources used, and the number of merchandise items stocked. Finally, these factors are used to compare departments using automatic data processing inventory management systems with those that do not.

In this chapter the analysis covers Stores 1, 2, 4, and 5. Store 3 did not participate in this phase of the study. In Store 5 the department sample was reduced from fifteen to three departments in the ready-to-wear apparel area and to one in the staple merchandise area since automatic data processing was not in use for inventory management.

The following analysis is subject to limitations whose effect cannot be fully judged from available information. Questionnaires from a number of sample department buyers were not returned even after several attempts to get them. Most stores handled the department questionnaire on a buyer option basis and data from the unrecorded departments was declined by the buyers. A personal follow-up on two of these departments did not indicate substantive reasons for unreported information which would materially change the analysis. One buyer had just returned from an overseas buying trip and was extremely busy. The second buyer indicated a tall pile of uncompleted paper work under which the questionnaire was placed and never again seen.

The nonreporting departments represent a significant part of the total sample and the missing responses could markedly alter the department profiles and resulting analysis. Another limitation is the ability of the buyers to accurately report the requested information. It is estimated that adequate reliability exists in this reporting. During the pretesting of the questionnaire three buyers were consistent in their answers to two successively administered questionnaires. Follow up interviews with five buyers in three stores indicated that the buyers were confident of their responses. The possibility of error and bias in

reporting is called to the readers attention but is not judged to be significant.

Selling Locations

Selling locations are defined as the number of separate locations merchandise from a given department is sold in the main and branch stores. The locations examined are permanent in nature. Seasonal outpost selling increases the number at certain periods of time such as during special sales, Christmas, Mother's Day and the like. Exhibit 17 lists the number of selling locations for the departments under study. The number of selling locations reported indicate that not every department sells its merchandise at every branch store. Also, certain departments sell merchandise in more than one location in the main store. There is no pattern in the number of selling locations by department. Store 1, for example, favored multiple selling locations in the main store. Store 4, in contrast, tended to have only selling location in the main store. In Store 1 the apparel departments managed only the full line branches, but in Store 4 the apparel departments managed all the branches except the warehouse store. The fewest number of selling locations were reported by several departments of Store 2 which sold at only two locations. The most number of selling locations was

EXHIBIT 17

NUMBER OF SELLING LOCATIONS IN MAIN STORE AND BRANCH STORE BY DEPARTMENT SAMPLE IN SELECTED DEPARTMENT STORES

Department Sample	Store 1		Store 2		Store 4		Store 5	
	Main	Branch	Main	Branch	Main	Branch	Main	Branch
House Dresses	2	2	n.r.	n.r.	1	7	1	7
Women's Better Shoes	1	2	1	1	1	4	1	3
Women's & Misses' Dresses	n.r.	n.r.	1	2	1	9	-	-
Formals & Bridals	1	6	1	0	n.r.	n.r.	-	-
Better Blouses	5	2	1	2	1	9	2	7
Women's Budget Shoes	1	2	2	2	1	9	-	-
Negligees & Robes	2	2	n.r.	n.r.	2	9	-	-
Men's Furnishings	1	2	3	2	1	7	-	-
Blankets	1	2	1	1	1	7	-	-
Corsets & Brassieres	4	4	1	2	2	7	-	-
Hosiery	3	4	1	2	1	7	-	-
Linens	1	2	1	2	n.r.	n.r.	-	-
Cosmetics	3	2	1	1	n.r.	n.r.	1	7
Drugs & Drug Sundries	2	2	1	2	n.r.	n.r.	-	-
Housewares	1	7	1	2	4	7	-	-

Note: n.r., indicates no response. Source: Store executive interviews.

reported by the housewares department of Store 4 with eleven locations.

Branch Stores

The nature of the inventory management process is partially determined by the number of locations and the amount of decentralization of control over stocks that is present. All of the sample stores have branch store operations that are merchandised primarily from the parent store. In all stores, the main store buyer or department manager made the final decisions on the type and quantity of merchandise that was offered at the branch. On this basis, the branch stores are dependent operations of the main store.

The examination of branch stores includes the number of stocking locations and the responsibilities of the branch manager in relationship to the main store buyer.

Types of Branch Stores

The number of branch stores associated with one parent store varied from three branches to ten branches in the department store sample. Exhibit 18 lists the stores studied and indicates the number and type of branches operated by each.

The branch stores are of three distinct types although all are related in their manner of operation.

EXHIBIT 18

NUMBER AND TYPES OF STORES OPERATED BY
SELECTED DEPARTMENT STORES

(April, 1965)

Store 1:

1 - Main Store
2 - Full line branch stores (without budget stores)
4 - Budget or basement type stores
1 - Warehouse outlet store
8 Total Stores

Store 2:

1 - Main Store
1 - Full line branch (including budget store)
1 - Semi-full line branch store (excluding major appliances)
2 - Warehouse outlets (home furnishings and clearance)
5 Total Stores

Store 3:

1 - Main Store
1 - Full line branch store (with budget store)
1 - Full line branch store (without budget store)
3 Total Stores

Store 4:

1 - Main Store
3 - Full line branch stores (with budget stores)
4 - Semi-full line branches (excluding home furnishings)
1 - Small branch store limited to apparel
1 - Warehouse store (home furnishings and clearance)
10 Total Stores

Store 5:

1 - Main Store
3 - Full line branch stores (without budget stores)
4 - Full line branch stores (with budget stores)
9 Total Stores

Source: Store interviews

The first type, and one that occurred most frequently, is the full-line branch. This type of branch may or may not have a budget store, although most branches carry certain basement lines in addition to the regular mainstore merchandise. The second type of branch is the budget store. This branch is usually merchandised and operated by the basement store division. In some cases the merchandise offered is specially purchased for the budget store operation. The third type of branch is the warehouse or outlet type store. This store is usually operated in a section of the department store's main warehouse. The type of merchandise offered is home appliances, home furnishings, and damaged or clearance items.

Basement Store Division

In the store sample, the budget store and the basement store merchandise was usually purchased and merchandised by a separate division within the store. There was no indication that the inventory management problems and methods were different in this division than in the mainstores.

The departments studied are commonly referred to as mainstore departments, although, the merchandise offered in this division often overlaps the merchandise offered in the basement store. Some branch stores are a

combination of budget type and full-line branch stores with the result that the buyers of some departments did not have to merchandise all of the branch stores. Exceptions were in the staple merchandise departments such as drug sundries where the drug buyer normally managed all branch locations offering these items.

Budget type branches are included in the selling location analysis only when the department buyers manage departments in these branches.

Branch Store Manager's Position In Inventory Management

The position of the branch store department manager in the inventory management process varies widely in the sample departments. The managers of some departments are allowed maximum latitude in the management of the branch department inventory. Other managers operate in an advisory capacity only and serve largely as an information transmission link with the central department buyer.

The branch store manager's position is different among the stores due to variations in store policy, number of branches, and the organization of the branch stores. The branch manager's position also varies among different departments within each store and with the buyers preference.

This study does not attempt to establish causality, but to determine the pattern between branch manager responsibility, as perceived by the buyer, and the use of automatic data processing.

The branch store managers are normally limited to a partial authority capacity since no department in the sample maintained adequate inventory records at the branch stores. Several buyers acknowledged that branch store managers kept an informal record of certain information such as quantities on order and movement records of "fast" moving items, but that on the whole, they relied on visual control and stock transfers from the main store for their primary inventory management functions.

The buyer of each sample department studied was asked to indicate the nature of the branch manager's job in respect to inventory management at the branches. Exhibit 19 lists the branch store manager's inventory management responsibility as described by the department manager. The description categories are as follows.

1. Advisory Relationship. The branch manager does little more than coordinate plans developed by the main store buyer. Emphasis is on visual control of inventories and information relay.

2. Partial Responsibility. The branch manager makes specific recommendations that are usually adopted, although he does not have final authority over branch stocks or stock transfers and related activities.

EXHIBIT 19

BRANCH STORE DEPARTMENT MANAGER'S RESPONSIBILITY FOR BRANCH INVENTORY MANAGEMENT IN SELECTED DEPARTMENT STORES

Department Sample	Store 1	Store 2	Store 4	Store 5
House Dresses	P-Resp[a]	n.r.[a]	P-Resp[a]	P-Auth
Women's Better Shoes	Advisory	P-Auth	P-Resp[a]	P-Resp
Women's & Misses' Dresses	n.r.[a]	P-Resp[a]	Advisory[a]	-
Formals & Bridals	P-Auth	(b)	n.r.[a]	-
Better Blouses	P-Resp[a]	P-Resp[a]	Advisory[a]	Advisory
Women's Budget Shoes	P-Resp	P-Auth	P-Auth[a]	-
Negligees & Robes	P-Resp[a]	n.r.[a]	P-Auth	-
Men's Furnishings	P-Resp	P-Auth[a]	P-Auth	-
Blankets	P-Resp	P-Resp	P-Auth	-
Corsets & Brassieres	P-Auth[a]	P-Resp	P-Auth	-
Hosiery	P-Resp	n.r.	P-Auth	-
Linens	P-Resp	P-Resp	n.r.	-
Cosmetics	P-Auth	P-Resp	n.r.	P-Resp
Drug & Drug Sundries	P-Auth	P-Resp	n.r.	-
Housewares	P-Auth	P-Auth	P-Auth	-

Note: Advisory[a] is advisory relationship; P-Resp is partial responsibility; P-Auth[b] is partial authority. [a]Automatic data processing used in inventory management. [b]Merchandise sold in the main store only. n.r., indicates no response. Source: Questionnaires.

3. Partial Authority. The branch manager has limited authority over branch stocks. He may requisition stock from pool or warehouse inventory. In some instances he may reorder from a resource subject to appropriate controls.

The responses from the buyers are about evenly divided between the latter two categories with only four department buyers reporting advisory relationships. The partial authority relationships tended to occur in the staple merchandise departments and the partial responsibility relationships in the apparel departments. It is significant that the tendency for greater branch manager responsibility occurred in the staple merchandise departments such as housewares where changes in customer demand, product offerings, and stocking requirements are usually minimal. Conversely, few branch managers have more than partial responsibility in the apparel departments where changes are more frequent.

Selling Locations and Branch Manager Responsibility

A comparison of the number of selling locations and the nature of the branch manager's duties in respect to inventory management indicates a loose relationship between these two factors. Exhibit 20 is a scatter diagram that shows the two variables. One tendency noted is that where

EXHIBIT 20

SCATTER DIAGRAM OF NUMBER OF SELLING LOCATIONS AND BRANCH DEPARTMENT MANAGER RESPONSIBILITY IN INVENTORY MANAGEMENT

Number of Selling Locations	Advisory	Partial Responsibility	Partial Authority
1			
2		xx	x
3	x	xxxxxx ⓧⓧ	x
4		x ⓧⓧ	xxx
5		ⓧ	ⓧ
6			
7		x ⓧ	x
8		x ⓧ	xxxx ⓧ
9	x		x
10	ⓧⓧ		ⓧ
11			xx
Total	4	19	17

Note: Circled marks indicate the use of automatic data processing in inventory management. Source: Exhibits 18 and 19.

a larger number of locations are merchandised from the main store, the branch manager assumes a more active part in inventory management. The circled mark indicates the departments that use automatic data processing in inventory management. It is noted that the majority of applications are in departments where the branch manager has only partial responsibility for the branch inventory. Also, a significant number of department buyers that report partial branch manager authority in managing branch stocks do not use automatic data processing.

The problems of managing multiple branch store locations from the main store departments increase as the department stores add suburban branches as they currently are. The 100 top volume department stores at present operate 619 branch stores and according to their expansion plans will operate between 800 and 900 branches by 1970.[43] On this basis, the impact of branch store merchandising locations is of continuing importance in inventory management.

Department Characteristics

In this section, a profile of the sample departments is developed. Part of the profile provided the basis for

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[43]"Branch Stores...Is the Tail Wagging The Dog?," Department Store Economist, August, 1965, pp. 19-21.

department selection. The remainder covers other significant factors that affect the inventory management process. These characteristics are not exhaustive of the possible measures, but are selected as meaningful measures of the nature of inventory management problems that must be dealt with. Under separate headings, the department characteristics are described by the nature of merchandise sold, nature of customer demand, buying frequency, number of vendors used, and number of items carried in inventory.

Nature of Merchandise

An examination of the nature of the merchandise is made to determine fashion perishability of the inventory a department buyer or manager must manage. All buyers of the selected departments were asked to describe the composition of their inventory by one of the following categories:

1. Fashion Perishable. Merchandise items are fashion perishable and would not normally be carried from one season to the next as their continued popularity is not assured.

2. Partially Fashion Perishable. Merchandise items have a distinct fashion element, although styles do not usually change each season. Style life is varying in

length, but the majority of offerings last for more than one season. Items are best described as being partially fashion perishable.

3. Staple. Merchandise items are considered staple. Changes in product offerings are made slowly and inventory obsolescence is not a major problem. Merchandise is likely to be in year around demand, although distinct selling peaks occur. A number of these items would be considered "never out" items.

Each buyer in the sample departments indicated the number of merchandise items or styles that are described by each of these categories. This information was then converted into percentages for each category with the total equaling 100 per cent. To illustrate the department characteristics in graphic form, the nature of the merchandise were converted into a single composite rating figure by weighting the percentages. Those items that are fashion perishable are weighted three-to-one, items that are partially fashion perishable are weighted two-to-one, and staple items are weighted one-to-one. A sample is given to indicate the method of weighting.[44]

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[44]Weighting of unlike data is often used to enable a linear comparison to be made in spite of the dissimilar data. The weighting system used in this example is selected for simplicity and ease of use. Weighting systems in general business use include the "Buying Power Index" developed by Sales Management Magazine's Survey of Buying Power and the "Consumer Price Index" published by the U. S. Department of Labor.

Nature of Merchandise	Per Cent		Weight		Rating
Fashion Perishable	20%	x	3	=	60
Partially Fashion Perishable	70	x	2	=	140
Staple	10	x	1	=	10
Total	100%				210

Departments that had all of their items in the staple category would have a rating of 100. If all the items were fashion perishable the rating would be 300.

Each sample department's merchandise is rated in this manner and the ratings are listed in Exhibit 21. Then by establishing two partition values between 100 and 300, departments with a rating of less than 167 are considered staple, departments with a rating between 168 and 223 are considered partially fashion perishable, and departments with a rating of 224 to 300 are considered fashion perishable.

Nature of Customer Demand

The study of the nature of customer demand examines the demand for merchandise items that the buyer must manage. The key factor in the demand analysis is the predictability of the demand. Each buyer in the sample departments was asked to indicate the number of merchandise items or styles that are described by each of the following categories:

EXHIBIT 21

SUMMARY OF NATURE OF MERCHANDISE AND CUSTOMER DEMAND RATINGS BY DEPARTMENT SAMPLE IN SELECTED DEPARTMENT STORES

Department Sample	Store 1		Store 2		Store 4		Store 5	
	Mer	Demand	Mer	Demand	Mer	Demand	Mer	Demand
House Dresses	300[a]	200[a]	n.r.[a]	n.r.[a]	300[a]	300[a]	300	300
Women's Better Shoes	292	271	300	300	230[a]	170[a]	247	253
Women's & Misses' Dresses	n.r.[a]	n.r.[a]	300[a]	200[a]	300[a]	300[a]	-	-
Formals & Bridals	(b)	(bP	n.r.	n.r.	n.r.[a]	n.r.[a]	-	-
Better Blouses	268[a]	191[a]	185[a]	200[a]	208[a]	158[a]	300	225
Women's Budget Shoes	255	159	235	200	180[a]	157[a]	-	-
Negligees & Robes	165[a]	190[a]	n.r.[a]	n.r.[a]	192	192	-	-
Men's Furnishings	109	106	139[a]	119[a]	146	112	-	-
Blankets	135	135	100	n.r.	160	180	-	-
Corsets & Brassieres	147[a]	135[a]	135	135	165	n.r.	-	-
Hosiery	159	149	n.r.	n.r.	200	n.r.	-	-
Linens	117	171	160	185	n.r.	n.r.	-	-
Cosmetics	127	145	100	100	n.r.	n.r.	100	150
Drugs & Drug Sundries	100	200	100	100	n.r.	n.r.	-	-
Housewares	112	106	160	160	120	130	-	-

Note: n.r., indicates information not reported. [a]Automatic data processing used in inventory management. [b]Merchandise purchased to customer order. Source: Questionnaire.

1. Random Demand. Demand is largely uncertain. Unit sales forecasts cannot be made with an appreciable degree of accuracy because of widely fluctuating demand or because offerings are new and historical demand data is not available.

2. Fluctuating Demand. Demand is somewhat predictable but fluctuates widely from unit forecasts. Demand predictions provide a guide-line, although significant variations are expected. Historical demand information for these or similar items provides a basis for estimating future demand.

3. Predictable Demand. Demand is predictable to the extent that unit sales plans are largely realized. Future demand is estimated within relatively narrow limits. Product sales have continued over several or more years, thus providing ample data for basing forecasts.

Merchandise items indicated by each category are converted into ratings in the same manner as the nature of demand. Random demand is weighted three-to-one, fluctuating demand is weighted two-to-one, and predictable demand is rated one-to-one. Demand ratings are shown in Exhibit 21.

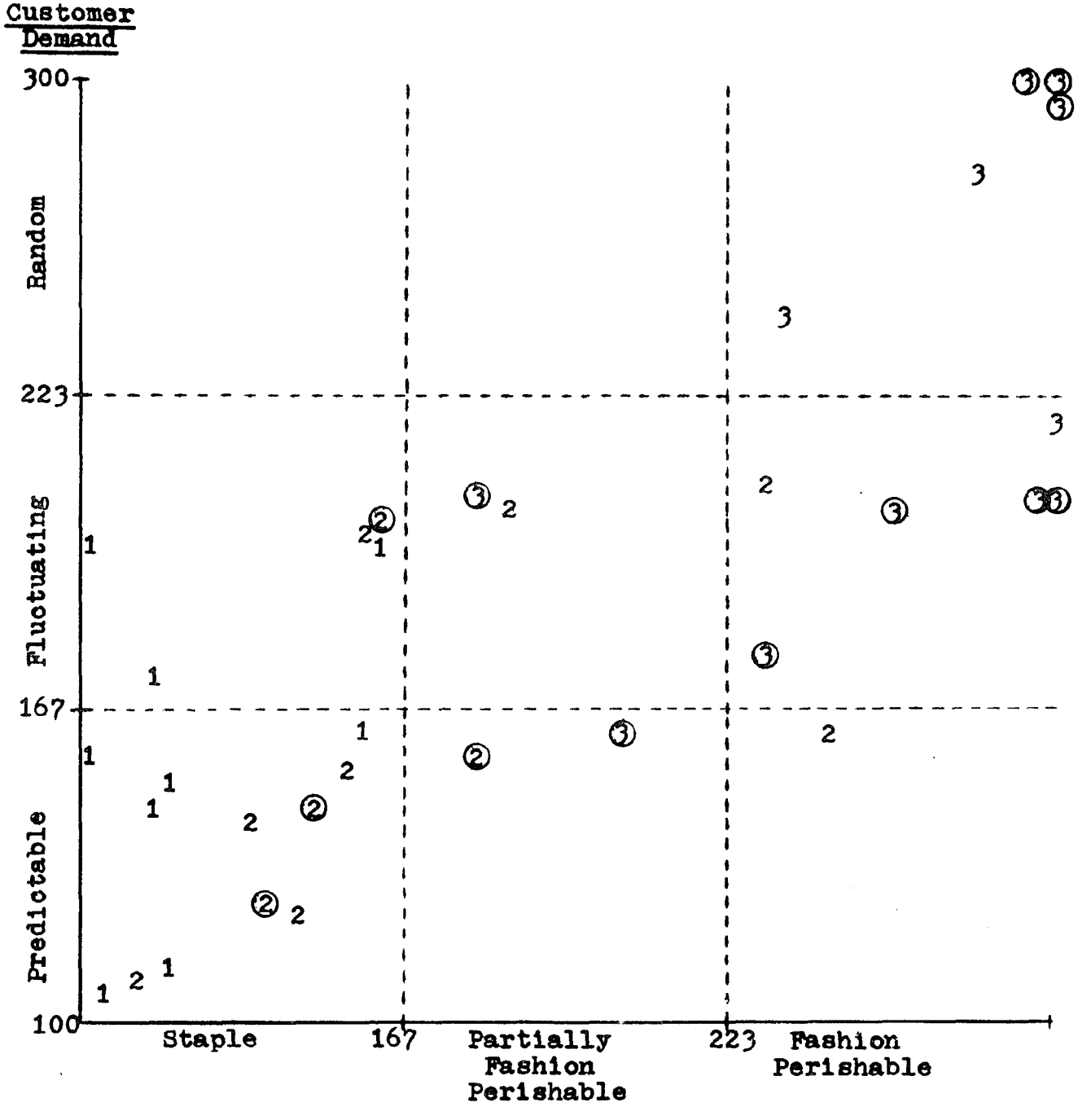
Department comparison

Exhibit 22 is a scatter diagram that shows the customer demand and merchandise characteristics ratings

EXHIBIT 22

SCATTER DIAGRAM OF THE RATINGS OF MERCHANDISE CHARACTERISTICS AND CUSTOMER DEMAND

Source: Exhibit 21



for the sample departments. Departments using automatic data processing in inventory management are indicated by a circle around the number. Coordinates marked 1 are departments selected for staple merchandise and predictable demand. Coordinates marked 2 are departments selected for characteristics of fluctuating demand and partial fashion perishability. Coordinates marked 3 are departments selected for characteristics of random demand and fashion perishability.

By examining Exhibit 22 it is seen that some variation exists among the buyers' descriptions of their merchandise and demand characteristics. There is limited variation in descriptions among buyers of departments with staple merchandise and predictable demand where all departments fall within the preselected categories. There is wider variation of description in the remaining two categories, although some clustering is evident. Generally, the pattern indicates better description agreement on merchandise characteristics than on customer demand. For example, seven department buyers reported almost all items or styles as fashion perishable with customer demand ranging between fluctuating and random.

The scatter diagram shows that the applications of automatic data processing tend to occur in those departments with merchandise that is on the fashion perishable and random demand end of the characteristic spectrum.

There is, however, no clearly defined pattern that would indicate that only these characteristics provide a better application of data processing based inventory management systems. In comparing the dispersion of all departments in each category with the departments reporting automatic data processing use, no pattern is apparent. Thus, within the store sample the application pattern likely reflects the inherent characteristics of the departments which are primarily ready-to-wear departments rather than the nature of use of automatic data processing.

Buying Frequency

The buying frequency in the sample departments and the use of automatic data processing are examined. Buying frequency indicates the static or dynamic properties of the inventory management problems. Static inventory management problems are those where no reorders are made to the inventory during the season and dynamic inventory management problems are those where additions and reorders are made. Merchandise that is purchased only once at the beginning of each season is likely to require a different approach to inventory management than merchandise that can be continually reordered.

To determine the static or dynamic nature of the inventory management process in the sample departments the

buyers in each department was asked to indicate the number of items or styles in their departments that is described by each category.

1. No Reorders. Merchandise items are not or cannot be reordered during the merchandising season. Items may be tested preseason, but after a full stocking commitment is made no further orders are received.

2. Reorder Twice or Less. Merchandise items are reordered once or twice during the merchandising season. Items may be tested preseason, but after a full stocking commitment is made no more than two reorders are received.

3. Reorder as Needed. Merchandise items are reordered more than twice during the season as needed. Ordering would include continual purchase of items that are stocked on a year around basis.

Buying frequency is rated in the same manner as the previous factors. No reorders are weighted three-to-one, reorder twice or less is weighted two-to-one, and reorder as needed is weighted one-to-one. These ratings are listed in Exhibit 23.

This exhibit shows that as expected, the bulk of the merchandise in the staple departments were reordered more than twice during the season. In the apparel departments fewer reorders were reported. The highest two ratings (fewest items reordered) were found in Store 5 which by preference does not necessarily reorder the same

EXHIBIT 23

RATINGS OF BUYING FREQUENCY BY DEPARTMENT SAMPLE FOR SELECTED DEPARTMENT STORES

Department Sample	Store 1	Store 2	Store 4	Store 5
House Dresses	200[a]	n.r.[a]	100[a]	n.r.
Women's Better Shoes	271	200	225[a]	269
Women's & Misses' Dresses	n.r.[a]	150[a]	n.r.[a]	-
Formals & Bridals	(b)	n.r.	n.r.[a]	-
Better Blouses	191[a]	224[a]	200[a]	288
Women's Budget Shoes	230	151	148[a]	-
Negligees & Robes	135[a]	n.r.[a]	192	-
Men's Furnishings	102	126[a]	136	-
Blankets	112	100	120	-
Corsets & Brassieres	106[a]	135	n.r.	-
Hosiery	102	n.r.	n.r.	-
Linens	100	140	n.r.	-
Cosmetics	109	100	n.r.	100
Drug & Drug Sundries	100	100	n.r.	-
Housewares	107	115	110	-

Note: n.r., Information not reported., [a]Automatic data processing used in inventory management., [b]Merchandise purchased to customer order. Source: Questionnaire.

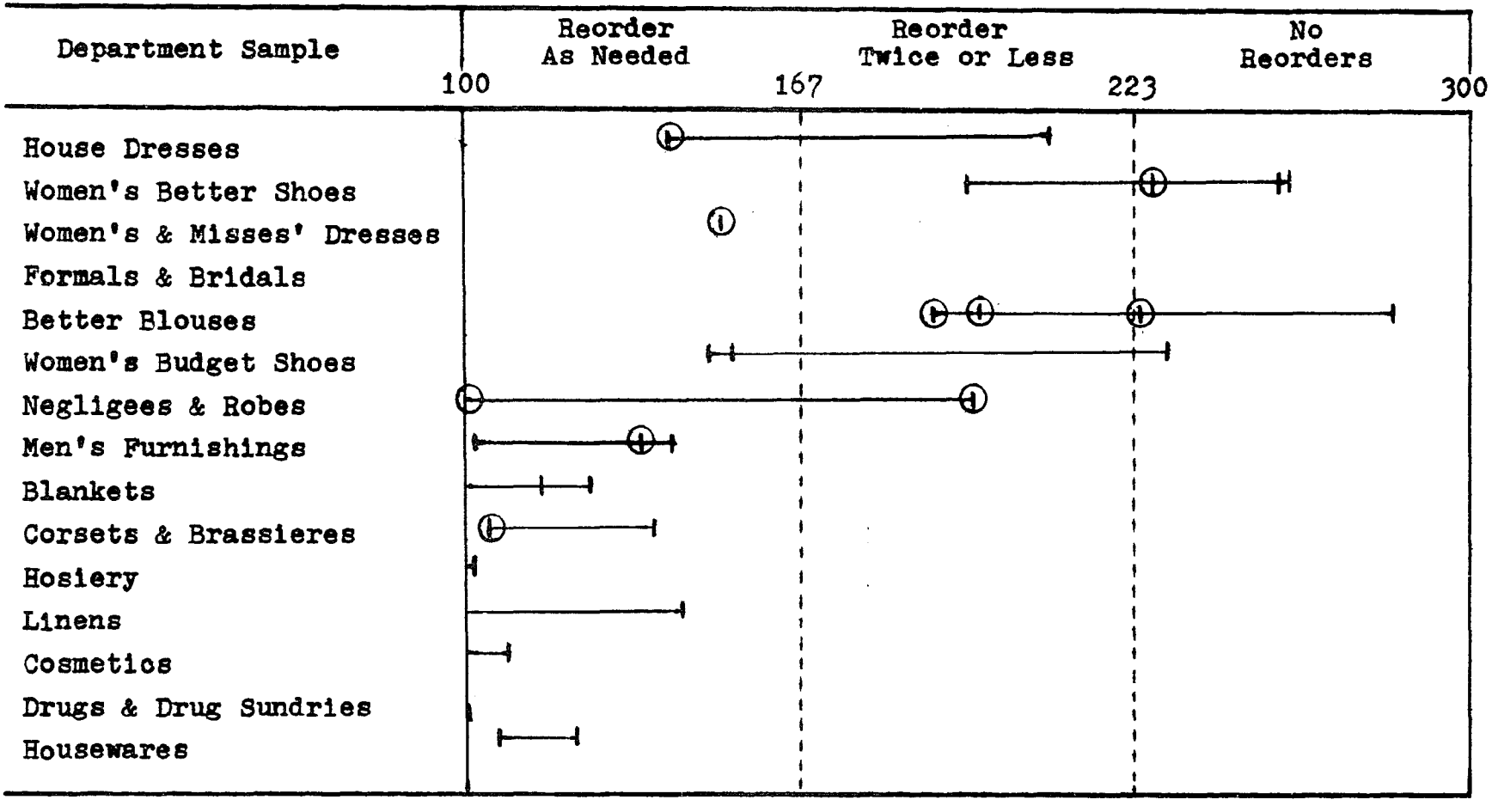
merchandise during the season. The ratings of the balance of the sample stores indicate that at least one-half of the items in the sample departments were reordered two or more times.

Exhibit 24 displays the ranges of buying frequency ratings for each of the sample departments. Based on these ranges, there is a sufficient number of items or styles in each category that are reordered to provide a substantial reorder activity requirement. Exhibit 24 shows that the range of reported ratings is greater in the apparel departments than in the staple departments. The fact that items can be reordered tends to place a significant value on the capability of recognizing sales movements in time to reorder. The applications of automatic data processing tend to be in those departments that reorder more frequently. This phenomenon is seen for the women's shoes, robes and negligees, and better blouses departments. Departments that reported a larger proportion of items reordered less frequently do not use automatic data processing.

The complexity of a department buyer's inventory management problem is affected by many facets of his job. In the prior three sections, aspects of inventory management from a theoretical problem viewpoint have been examined. In the following two sections the magnitude

EXHIBIT 24

RANGES OF BUYING FREQUENCY RATINGS BY DEPARTMENT SAMPLE
IN SELECTED DEPARTMENT STORES



Note: Circled marks indicate the use of automatic data processing in inventory management. Source: Exhibit 23.

of the sample departments' inventory management job is measured by the number of resources used and the number of items or styles managed.

Number of Resources

Each buyer in the sample departments was asked to indicate the average number of resources used by his department. The average number of vendors used was measured since seasonal fluctuation in vendor use was present in many departments. The buyer also reported the nature of any change that had occurred within the past one to three years.

Exhibit 25 lists the average number of resources reported used by each department buyer. The number of resources used by the same departments does not appear significantly consistent among stores. Some differences, however, are seen in the number of resources used among different merchandising departments. As an example, the number of resources is markedly higher in the drug sundries and cosmetics departments than other departments. The fewest number of resources used in the sample departments is in the shoe departments. In the blouse departments there is a substantial variance in the number of resources used. Store 2 reports buying from eighty resources, yet Store 4 reports buying from only nine resources. Both of these departments use automatic data processing in inventory management.

EXHIBIT 25

AVERAGE NUMBER OF RESOURCES BY DEPARTMENT SAMPLE
IN SELECTED DEPARTMENT STORES

Department Sample	Stores 1	Stores 2	Stores 4	Stores 5
House Dresses	22[a]	n.r.[a]	20[a]	-
Women's Better Shoes	5	32	9[a]	8
Women's & Misses' Dresses	n.r.[a]	45[a]	140[a]	-
Formal & Bridals	40	34	n.r.[a]	-
Better Blouses	68[a]	80[a]	9[a]	20
Women's Budget Shoes	12	25	5[a]	-
Negligees & Robes	35[a]	n.r.[a]	40	-
Men's Furnishings	48	150[a]	43	-
Blankets	14	6	20	-
Corsets & Brassieres	49[a]	n.r.	40	-
Hosiery	25	20	15	-
Linens	35	28	n.r.	-
Cosmetics	170	150	n.r.	200
Drugs & Drug Sundries	200	130	n.r.	-
Housewares	35	50	n.r.	-

Note: n.r., information not reported. [a]Automatic data processing used in inventory management. Source: Questionnaire.

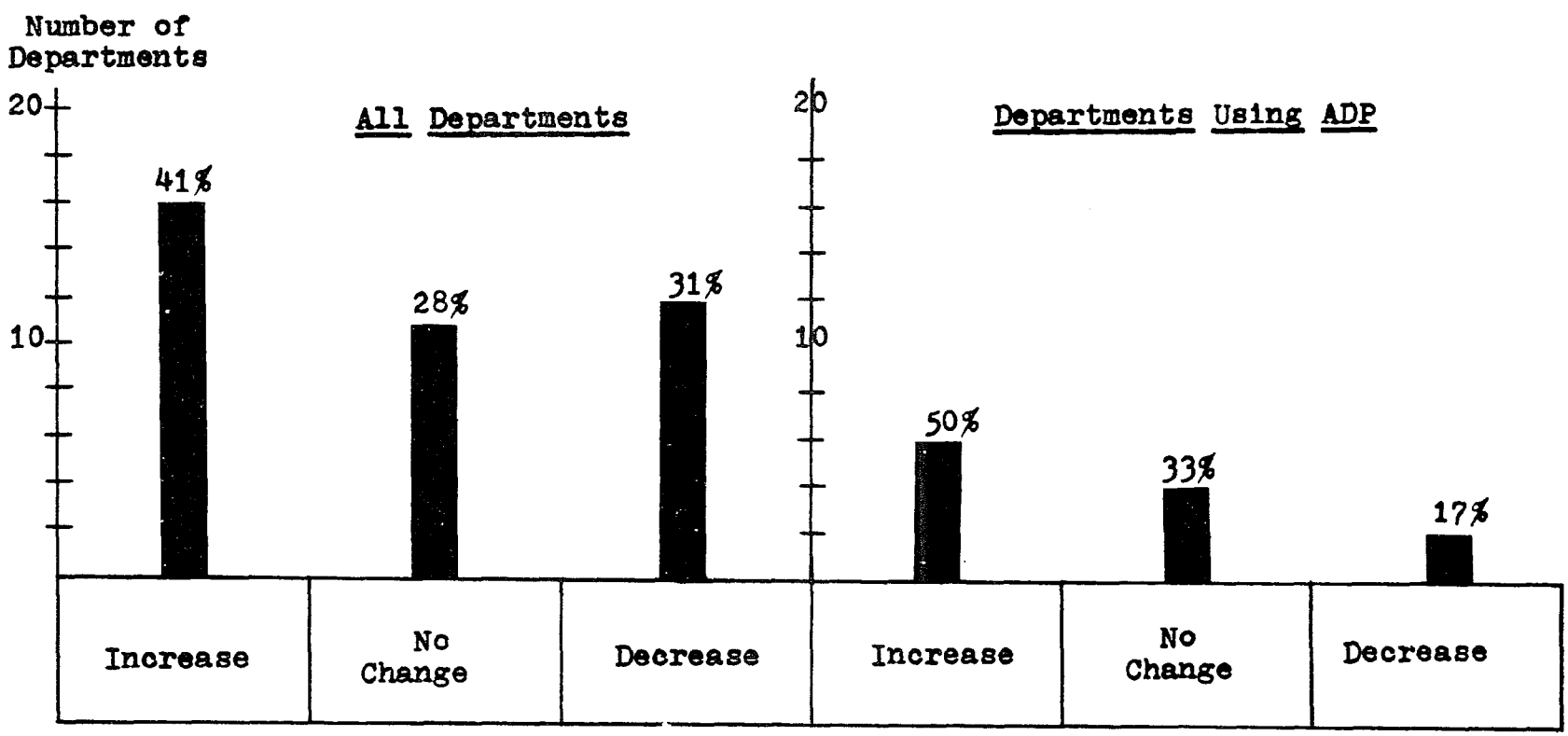
Variation in the number of resources used does not seem important in the application of automatic data processing based inventory management systems. A greater number of vendors increases the complexity of inventory management systems, but probably has little influence on the soundness of an automatic data processing application. At the time of the store interviews, several department store executives indicated that advanced systems would likely increase the desirability of using fewer and larger vendors. There is no indication that current automatic data processing inventory management systems used in the typical manner has resulted in a reduced number of resources being used. Exhibit 26 shows the number of all departments reporting changes in the number of resources used and the same information for departments using automatic data processing. Some variation is noted, but the number of departments reporting each change category is proportionally similar for both groups. The departments using automatic data processing reported slightly more increases than no change and decreases, although not significantly more.

Number of Items or Styles

The nature of the inventory management task is partially determined by the number of merchandise items or styles in each of the sample departments including

EXHIBIT 26

NUMBER OF SAMPLE DEPARTMENTS REPORTING CHANGES IN AVERAGE NUMBER OF RESOURCES USED WITHIN PAST 1 TO 3 YEARS



Source: Questionnaire.

branch store locations. The number of reported items or styles reflect identifiable categories of merchandise. This analysis treats the item or style grouping only. The number of merchandise items in each department were sought, but, many departments maintained inventory records by style exclusive of sizes and color. At the time of survey, many buyers were unable to provide item information from their records. Because of variations in the number of items within each style, no attempt to convert styles to items is made in Exhibit 27 where both classifications are shown. Like the number of vendors used, the number of merchandise items and styles maintained by each department shows no clearly defined pattern. The mixture of reporting modes precludes any significant analysis of variations among similar departments. The only apparent variation noted is that the number of merchandise items maintained in the drug and cosmetics departments are greater than in other departments.

Changes in the average number of items or styles carried within the past one to three years are tabulated in Exhibit 28. A comparison is made between all sample departments and the departments using automatic data processing in inventory management. It is seen that the majority of departments reported increases in the number of items or styles now carried in inventory. Departments

EXHIBIT 27

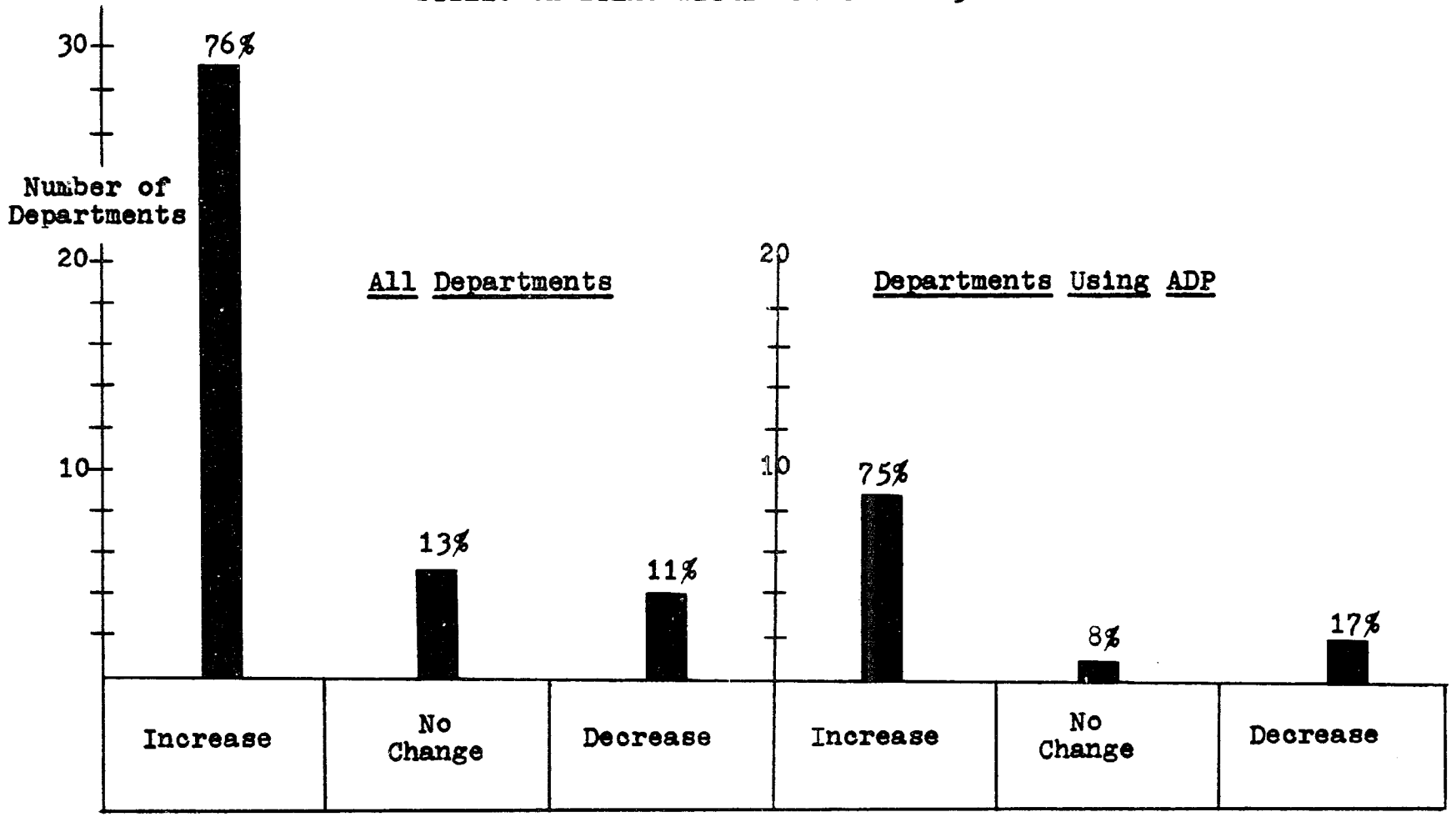
AVERAGE NUMBER OF MERCHANDISE ITEMS OR STYLES BY DEPARTMENT
SAMPLE IN SELECTED DEPARTMENT STORES

Department Sample	Store 1	Store 2	Store 4	Store 5
House Dresses	350 Styles[a]	n.r.[a]	n.r.[a]	-
Women's Better Shoes	240 Styles	925 Items	n.r.[a]	78 Styles
Women's & Misses' Dresses	n.r.[a]	575 Styles[a]	1200 Styles[a]	-
Formals & Bridals	200 Styles	8 Styles	n.r.[a]	-
Better Blouses	539 Styles[a]	2000 Items[a]	120 Styles[a]	400 Styles
Women's Budget Shoes	115 Styles	600 Styles	33 Styles[a]	-
Negligees & Robes	n.r.[a]	n.r.[a]	875 Styles	-
Men's Furnishings	4284 Items	1400 Items[a]	n.r.	-
Blankets	50 Styles	200 Items	50 Styles	-
Corsets & Brassieres	375 Styles[a]	541 Styles	n.r.	-
Hosiery	300 Styles	443 Styles	n.r.	-
Linens	140 Styles	1000 Items	n.r.	-
Cosmetics	11000 Items	10000 Items	n.r.	8500 Items
Drugs & Drug Sundries	5000 Items	5000 Items	n.r.	-
Housewares	3000 Items	500 Items	n.r.	-

Note: n.r., indicates information not reported. [a]Automatic data processing used in inventory management. Source: Questionnaires.

EXHIBIT 28

NUMBER OF SAMPLE DEPARTMENTS REPORTING CHANGES IN NUMBER OF STYLES OR ITEMS WITHIN PAST 1 TO 3 YEARS



Source: Questionnaire.

using automatic data processing also report an increase in the number of items or styles carried. The departments using automatic data processing do not report changes significantly different than the total of all sample departments.

CHAPTER VI

REASONS FOR AND RESULTS OF USING AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT

The reasons for using automatic data processing in inventory management and the reported results of its use were determined in two ways. First, the controller or his representative was asked to rate the reasons for using automatic data processing in inventory management. The source of the indicated ratings was also determined by asking the basis for the rating. For example, was the reason based on a definitive study that treated the particular reason, from available analytical data, or on the subjective judgment of the executive.

Second, the buyers of the sample departments that use automatic data processing were asked to indicate the inventory management performance attributed to its use. These buyers were then asked to indicate possible reasons why performance changes had occurred.

In the following analyses, the use of automatic data processing is not explicitely separated from the included system. The performance of a computer in the area of inventory management applications depends largely

upon the systems and programs used rather than upon the electronic equipment. For this reason, the advantages and disadvantages of changes from the traditional methods of inventory management made as a part of the systems development are inherent in the evaluation of the use of automatic data processing. An evaluation of the basic contributions of the computer is made in the analysis of reasons for its use. Attributes of economy, accuracy, and timeliness reflect the primary processing capabilities of the computer.

Attention is called to potential bias resulting from the relative ability of the store executives to accurately respond to the questions that are asked. Bias resulting from reactions to computer oriented change is also possible.

To minimize internal influences, all questionnaires completed by the buyers are returned directly by mail so buyers would not supply an acceptable answer rather than a factual one. In addition, the department store executives interviewed did not appear to suppress criticisms of their computer based inventory management. Indications were that buyers were also candid in their response. Problems of bias are judged to neither favor or disfavor the final results and conclusions of this study.

The controllers stated reasons for the use of automatic data processing in inventory management are indicative--not conclusive--of the goals of this application since there was no way of appraising the controllers knowledge of the original application decision. Finally, in all sample stores the controller and his staff seemed to support a factual appraisal of the computer and no intentional bias was apparent in their responses.

Reasons for the Use of Automatic Data Processing

The controller or his representative in each store was asked to evaluate the suggested reasons of: (1) economy, (2) accuracy, and (3) timeliness for the use of automatic data processing in inventory management. Additional reasons given by the executives were: (4) facilitating data collection and (5) capacity for growth. Each of these reasons are examined in the following section. Because of the relative newness of inventory management applications, the reasons or goals examined were still under evaluation by the sample stores and thus, the information given typically reflected current perspective.

Economy

One of the major difficulties in determining the economic benefits or absence of economic benefits from

using automatic data processing in inventory management is the problem of cost sharing and cost allocation. When a store's computer installation is fully used, the allocated costs of processing data are minimized. In installations that are under-utilized, the cost of processing data is higher. The executives in the sample stores indicated that their computers were not being fully used and felt that additional applications are needed to reduce the data processing cost allocation by increased sharing of the facilities cost.

Cost premium

All stores in the study had made definitive cost studies and had detailed cost data for the inventory management applications of data processing. Citing internal reports, no store executive reported cost savings resulting from the use of automatic data processing. Most executives commented that costs had been reduced from earlier levels, but that the present cost was greater than other manual methods of processing inventory management information. This higher cost, however, must be placed in perspective. In all sample stores one or more departments using data processing were receiving additional information not received from a previously used manual system. When asked about this additional information, executives indicated that the cost of getting

point-of-sale input information, preparing the reporting system, and programming the computer constituted the major cost. Once this capability was established, additional information output was negligible in cost. In spite of negligible cost of additional information the additional cost was yielding additional information in many inventory management applications examined.

The cost findings in all stores drew approximately the same increased cost conclusions. Store 5's findings paralleled the others even though they do not currently use automatic data processing for inventory management. Store 5 is operating under a management policy that requires automatic data processing to be cost savings justified and after two years of study, cost savings are not anticipated.

Cost compensation

Since no store reported cost savings, the controllers and data processing managers were asked what benefits, if any, offset this increased cost. The executives cited specific examples of improvements that resulted from the use of automatic data processing, although many benefits were in the expectation stage and not a realized fact. All stores indicated that they errored on the conservative side when estimating the time and expense required to set up an inventory management system.

As an example of benefits received, Store 1 reported that automatic data processing costs more, but that they are getting increased information content into their inventory management reports. This store also indicated that in the corset and foundation department, where an automatic data processing based inventory management system was being tested, those vendors who are cooperating with the automatic reorder phase of the test are experiencing increased sales. These sales increases were attributed to improved overall management of those stocks. Store 1 was not able to estimate what value might be attached to an improvement in customer service and sales.

In Store 2, processing of inventory management information is requested by the buyer. The main purpose of automatic data processing is to summarize point-of-sale information and to prepare comparative reports for the department managers. Costs were cursorily examined, but were not a major factor. The management of the store had made a commitment to automatic data processing and was working to make the best application of this equipment. Inventory management was only one of the applications under regular evaluation. Store 2 was anticipating a benefit payoff with the use of automatic data processing, but had not achieved this goal at the time of the interviews. Work was being done to adapt more routine clerical

operations to the computer, thus spreading the cost of the data processing installation and improving its economic performance.

Store 3 executives indicated that, although automatic data processing has not given demonstrable savings in the area of inventory management, it had reduced the expense that would have been incurred in collecting and processing information from a branch store that was opened. Store 3 executives indicated that studies of the benefits of automatic data processing in inventory management showed the benefit/cost ratio improves with each branch store added to the system. These studies covered two branch stores that were recently opened.

Store 4 was seeking improved overall economy of operation by increasing the number of applications on the computer. The increased use was expected to bring costs down to or below the manual processing level in inventory management applications. The controller anticipated that additional applications would be in other areas than inventory management so that the proportionate use for inventory management would be lower. He indicated that the greatest current advantage was the store's past experience with automatic data processing applications. On the basis of this experience, the controller expected the present data processing installation to show cost justification in the near time frame.

In all sample stores (except Store 5) the automatic data processing department has a separate budget and cost responsibility. Typically, the total cost of operation of this department is allocated to the activities that use it. Effective use of equipment, or the lack of effective use, serves to decrease or increase the allocated cost. Thus, all applications including inventory management are in effect charged for computer nonuse. If the resulting charge for nonuse is large, it tends to penalize the users of automatic data processing and to discourage further uses. Since additional uses of the computer are being developed, an incremental cost approach to computer charges might give a better cost picture. That is, the data-processing applications would be charged on the basis of cost for the time actually used. Costs resulting from nonuse would be charged elsewhere. Judging from the idle capacity mentioned by each store, this approach - if adopted - would significantly lower the costs quoted for the use of automatic data processing.

Accuracy

The analysis of accuracy as a reason for the use of automatic data processing in inventory management can be either approached as just computer accuracy or broadly

as system accuracy. Since the output of automatic data processing is only as accurate as the system accuracy, the examination of accuracy is primarily approached on a system basis. Accuracy is discussed in the context of operational or normal accuracy after computer programs and inventory management systems have been tested and are functioning routinely. The initial inquiry into accuracy concerned the computer itself. The data processing managers in all sample stores reported that the computers were inherently accurate and processing errors were negligible. They did acknowledge an accuracy problem in the data input.

Where sales information was used solely for daily sales movement reports, inaccuracies had mild consequence and were periodically corrected by a physical count of merchandise. Where perpetual inventory records were maintained by computer, the problem of accuracy was greater in importance. Several buyers pointed out that one advantage of manual inventory management information systems is that a clerical worker was able to correct apparent errors during information handling. At this time, computers do not have this flexibility. Furthermore, input data errors can be substantial and remain undetected until physical inventory or spot checking uncovers them. For example, through incorrect punching a record of a whole shipment may be lost. The record

system would indicate no items sold when in actuality the merchandise may be sold out. Major sources of error are discussed in the following two sections.

Point-of-sale

A frequently mentioned source of inaccuracy in perpetual inventory management systems was point-of-sale information recording. Information is usually recorded in three ways: print punch tags, written saleschecks, and recording sales registers. All three modes of information input are subject to inaccuracies. At the time of the study, none of the sample stores were using written saleschecks for computer input. A limited use of recording sales registers was reported, but the bulk of inventory management system input was print punch tags. The principal input accuracy problem is also with print punch tags. Instead of being collected at the time of sale, tag stubs are either not picked up or are lost after being collected. Of the tag stubs collected, some are mutilated and cannot be machine converted into usable computer input. These errors--when they occur--understate sales movements and overstate inventory position. Various techniques are used to improve tag collection such as interlocks that prevent activating the sales register until a print punch tag stub is inserted into a slot. These devices are supplemented by periodic reminder programs for sales employees.

All of the stores contacted had one or more departments where print punch tag collection was a problem and where input accuracy to the computer was difficult to attain. Store 3 reported that with a reasonable amount of effort, some departments are able to maintain above a 90 per cent tag collection rate. A rate of 90 per cent tag collection seems to be the typical standard after reminder programs.

Returns and resales

In those departments using a perpetual inventory management system, merchandise returns must be reentered into the inventory record. Thus, the point-of-sale record accuracy extends to returns as well as sales. Exhibit 29 lists returns and allowances for selected departments reported by The National Retail Merchants Association. This data covers the main stores only and includes allowances, but is indicative of the magnitude of the merchandise return problem in the sample departments. As shown, above average returns and allowances rates occur in apparel, shoe, bedding, and housewares departments. It is noted that above average returns and allowances are reported for department categories that used automatic data processing in the store sample. Merchandise inventory records may be inaccurate because a customer return is

EXHIBIT 29

SALES RETURNS AND ALLOWANCES FOR SELECTED DEPARTMENTS

(Department stores reporting over fifty million dollars annual sales in 1963)

Department	Per Cent Main Store Gross Sales
Housedresses	20.7%
Women's Better Shoes	12.7
Women's & Misses' Dresses	19.4
Formals & Bridals	9.8
Better Blouses	13.8
Women's Inexpensive Shoes	9.6
Negligees & Robes	13.8
Men's Furnishings	6.7
Blankets	10.5
Corsets & Brassieres	3.8
Hosiery	3.6
Linens	7.7
Cosmetics	2.4
Drugs & Drug Sundries	3.1
Housewares	9.2
Main Store Average	7.7%

Source: Departmental Merchandising and Operating Results of 1963 (New York: National Retail Merchants Association).

not recorded or a return does not have a ticket attached and is resold without being properly identified. The problems of high return rates tend to impair the use of automatic data processing because of potential inaccuracies in the returns data input. As an example, Store 2 reported that an automatic data processing test in the linens department was discontinued because a 20 per cent decorative return and a 15 per cent error in collecting tags at the time of sale rendered the system inoperable.

Impact of accuracy problems

The stores that rely solely on central inventory record processing were more troubled by problems of accuracy than the stores that rely on departmental unit clerical employees. Store 2 is an example of how the solution to accuracy problems were decentralized. In this store, the data processing department handles only the print-punch tag stubs that can be machine converted. Tickets that are mutilated or otherwise cannot be machine converted are returned to the department unprocessed. Department unit clerical employees then make the necessary changes in the records to indicate those units that are not recorded. The data processing reports are often used to prepare manual reports of the type that have been traditionally used, thus the major responsibility for correcting inaccuracy remains in the department being

served. The data processing department does not correct input errors in the normal course of its operation.

In contrast, where inventory management information processing is highly centralized, errors are more difficult to handle. For example, the data-processing department of Store 3 prepares an error analysis report three times a week. This report is distributed to all departments so that they are aware of the errors traced to their own operation. Errors of the data-processing department are also shown so that anyone who depends upon the computer output is fully aware of where inaccuracies are occurring.

In response to questions about accuracy, all of the department store executives indicated that the use of automatic data processing had brought the accuracy problem to the forefront in the inventory management process. The executives indicated that the use of automatic data processing was not made for reasons of accuracy and in many instances it had created greater problems of accuracy than the manual system it replaced. No sample store expected, nor was able, to get substantial accuracy increases from the use of automatic data processing prepared inventory management reports. The computer alone was more accurate in the preparation of reports, but the lack of flexibility in handling input errors created inaccuracy that was difficult to correct.

Timeliness

The problem of timely data has been compounding during the past five years with the growing number of items being controlled and the increasing number of branch locations opened by department stores. Timeliness, the reduction in the elapsed time from sale to report of sale, was cited by the executives of the sample stores as the principal reason for using automatic data processing in inventory management. Two main areas of improved speed in data handling are report preparation and branch store data collection.

Report preparation

The advantage of timeliness applies specifically to reports that are time consuming to prepare. Without automatic data processing, manually prepared reports of sales are normally available within several days of the sale except during rush periods when the lag is longer. Comparative reports, ones that indicate last year sales, immediate past period sales, and future period last year sales, are difficult to prepare in sufficient time to be useful to the buyer. With the use of data processing, the time problem is largely overcome.

In the sample departments using automatic data processing, daily sales reports were usually available the following day even after peak sale days. Comparative

reports were prepared more quickly since past sales data was stored in a magnetic tape file and the necessary historical information for reports picked up on an "as needed" basis by the computer. Timeliness in report preparation resulted from faster processing of current sales data and the immediate availability of past sales information.

Branch store information

A second factor in the timeliness of reports is the orderly flow of information from branch store locations. Collecting point-of-sale information from the branch stores is typically done with print-punch tags in the same manner as in the main store. The processing and reporting of these tags poses the problem. In the departments examined, the main store buyer merchandised most of the branch store locations and the bulk of reports were broken down by main and branch store data. A store with three branches--the minimum number in the store sample--would use a report showing item movement and on-hand position in all branch stores and main store. Under a manual system, the processing requirements are three times as great as in a single store operation.

With the use of automatic data processing, however, little additional time is required to produce a report

for as many as nine branches--the greatest number found in the department store sample.

Data Collection

When asked for other reasons for the use of automatic data processing in inventory management, the executives in all sample stores cited the improvement of data collection and reporting possible by using automatic data processing. Collection of merchandise management information from branch stores is one important aspect, but also mentioned was the problem of information collection from departments where there is a substantial amount of inter-selling. Inter-selling occurs when customers purchase merchandise located in one department at the sales register location in another department. Inter-selling is common in basement stores, in the branches, and in shops where coordinated merchandise from several departments is displayed and sold together. Planned inter-selling also occurs at area wrap and area checkout locations where customers from several departments purchase merchandise at a central location. When recording sales registers are available in areas of inter-selling, automatic data processing enables departmental reporting of sales, inventory, returns, and other related information easily and economically.

Capacity for Growth

Another reason given for the use of automatic data processing in inventory management was the inherent capacity for growth a data processing system provides. The capacity of manual systems of inventory management information handling were strained by the increasing volume of information needed and the increasing number of locations from which information originated. Two stores indicated that they began using automatic data processing in anticipation of maintaining efficient information processing and reporting during phases of future growth. All stores studied indicated that available capacity for growth exists in those departments using automatic data processing. The store executives also indicated that automatic data processing enabled the departments using it to merchandise additional selling locations from the parent store with the present merchandising staff without materially increasing inventory management costs. Most store executives expected future growth to eventually provide clearly apparent cost justification in respect to manual data processing alternatives.

Results from Using Automatic Data Processing In Inventory Management

Each buyer in the sample departments using automatic data processing rated the results of the use of this

equipment in inventory management. Ratings were developed for six major areas of merchandising performance. They are out of stock conditions, inventory turnover, stock age, stock requirements planning, identifying item movements, and controlling branch inventory. Buyers were asked to rate changes that had taken place since automatic data-processing reports had been used. Changes that had occurred within the past one to three year time frame were suggested as the comparison standard. The buyers requested to base their answers on available facts supported by their judgments.

In the questionnaires, the term data-processing reports was replaced by typical terms used in each individual store, such as computer report, IBM report and NCR report. In each category a choice of "does not apply" was used to give the buyer an opportunity to indicate the absence of the affect of automatic data processing reports on any area of merchandising performance.

Limitations due to the sample size are inherent in the study. The following analysis is based on a relatively small number of departments and these departments are only those responding to the questionnaire. A mistake or bias by one buyer could affect the results. The addition of information from departments that did not report could equally affect the analysis. There is no

apparent pattern, however, that suggests the unreported department response is significantly different than the reported data. The unreported departments are distributed among the sample in a manner that does not appear to favor one store or department. Errors due to bias are not judged to be significant, however, the reader is alerted to the possible consequence of misreporting.

The nature of inquiry into each of the performance areas and a summary of the number of departments reporting performance changes due to automatic data processing are presented in the following sections.

Out of Stock

Out of stock conditions can occur as a result of several inventory management system weaknesses. Inaccurate or incomplete inventory systems can prevent a department buyer from assessing his on-hand position from book inventory records. Also, an inventory record that is slow in being updated, often lacks the timeliness to accurately describe the inventory position at the time this information is needed. As a result of these and similar faults, previously used reports may have been less effective than automatic data processing based record systems.

In this segment of the study each buyer was asked to indicate to what extent the use of automatic data processing in place of manually prepared reports and

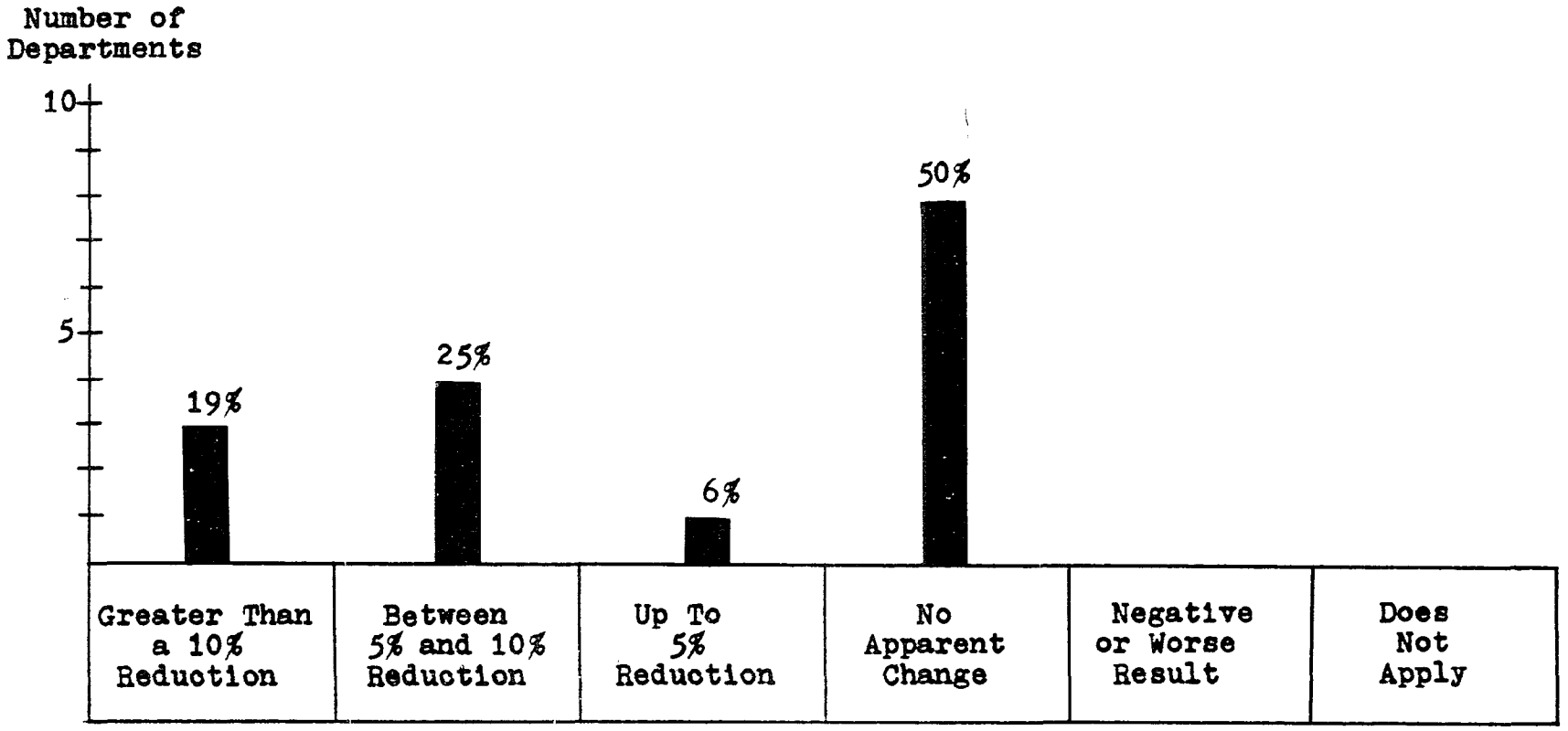
records has helped reduce the number of stock outs in the department. Changes in out of stock conditions only include those known by the department management. No attempt is made to include unknown stock outs. Each buyer selected his response from the following categories of change in the number of "stock outs."

1. Greater than 10% reduction.
2. Between 5% and 10% reduction.
3. Up to 5% reduction.
4. No apparent change.
5. Negative or worse result.
6. Does not apply.

Percentages in the first three categories are changes in the number of items out of stock in the department. Exhibit 30 indicates the number of departments reporting the indicated changes in out of stock conditions attributed to the use of automatic data processing reports. As shown in the exhibit, one-half of the buyers did not indicate a change in the out of stock conditions from use of automatic data processing. Three buyers reported a greater than 10 per cent improvement and four reported between a 5 and 10 per cent improvement. One buyer reported a 5 per cent improvement. These reported results do not conclusively indicate that improvements can be expected in all installations, but a significant number

EXHIBIT 30

NUMBER OF DEPARTMENTS REPORTING CHANGES IN ITEMS OUT OF STOCK FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

of buyers reported a better result in this performance area which suggests benefits were being achieved.

Inventory Turnover

Inventory turnover, a measurement which reflects the productivity of merchandise inventory, is examined for changes attributed to the use of automatic data processing in inventory management. To minimize variation in interpretation, inventory turnover is determined by reported changes in the sales to beginning of month inventory ratio in the sample departments. Each buyer indicated the appropriate rating of change by using the following scale:

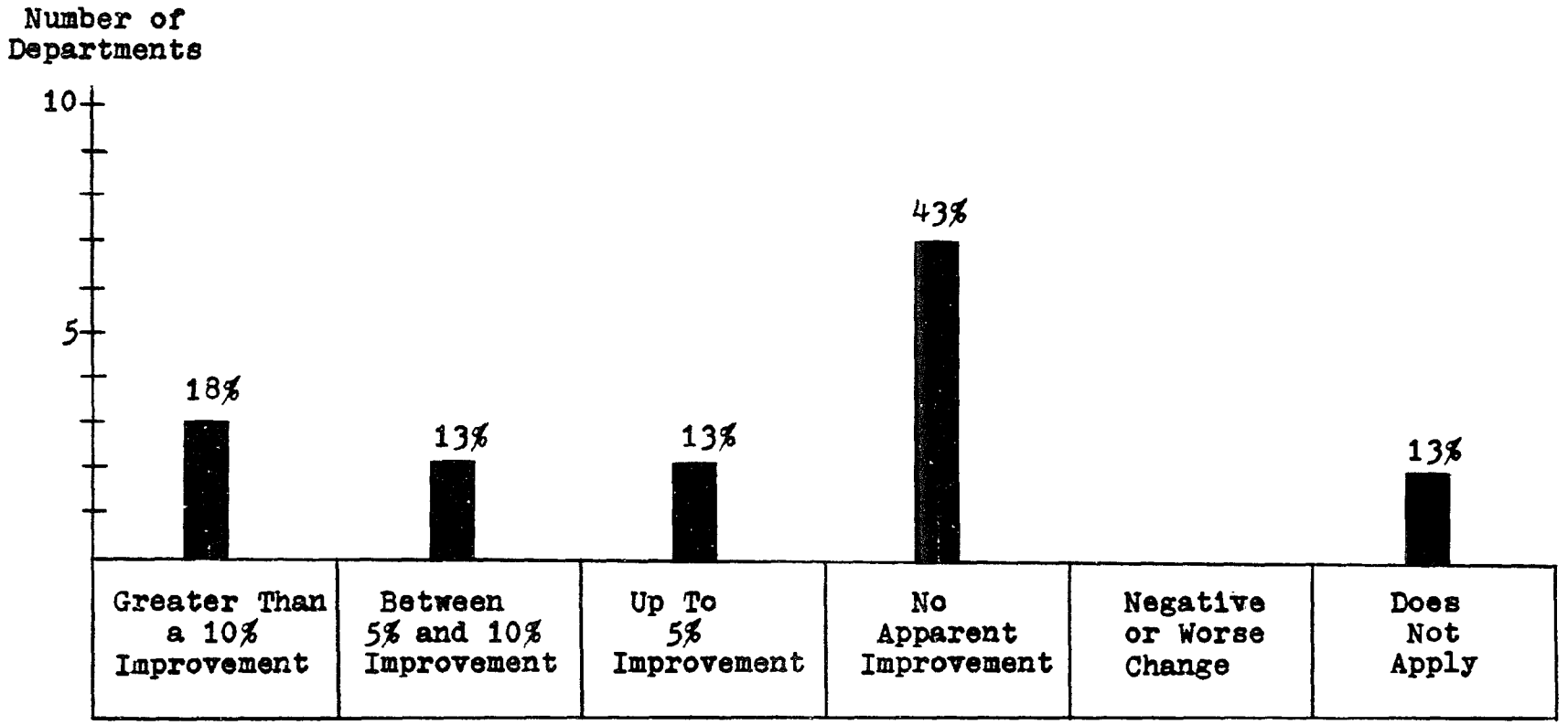
1. Greater than 10% increase.
2. Between 5% and 10% increase.
3. Up to 5% increase.
4. No apparent change.
5. Negative or worse result.
6. Does not apply.

Percentages in the first three categoreis indicate proportional increases in sales to merchandise inventory.

Exhibit 31 lists the number of departments that reported performance changes of the indicated type. As shown, the majority of buyers reported no change and two buyers felt that the use of automatic data processing did not apply to problems of inventory turnover as evidenced

EXHIBIT 31

NUMBER OF DEPARTMENTS REPORTING CHANGES IN INVENTORY TURNOVER FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

by sales to beginning of month inventory ratios. Three buyers reported greater than 10 per cent improvement and two each reported 5 to 10 per cent and up to 5 per cent improvement.

It is apparent from the divergent reports in the area of inventory turnover change that different results were experienced. This difference suggests that currently used automatic data-processing reports in the store sample selectively resulted in improved inventory turnover. Within the scope of this study, no factors were apparent that would account for differences in the results in this area of inventory management performance.

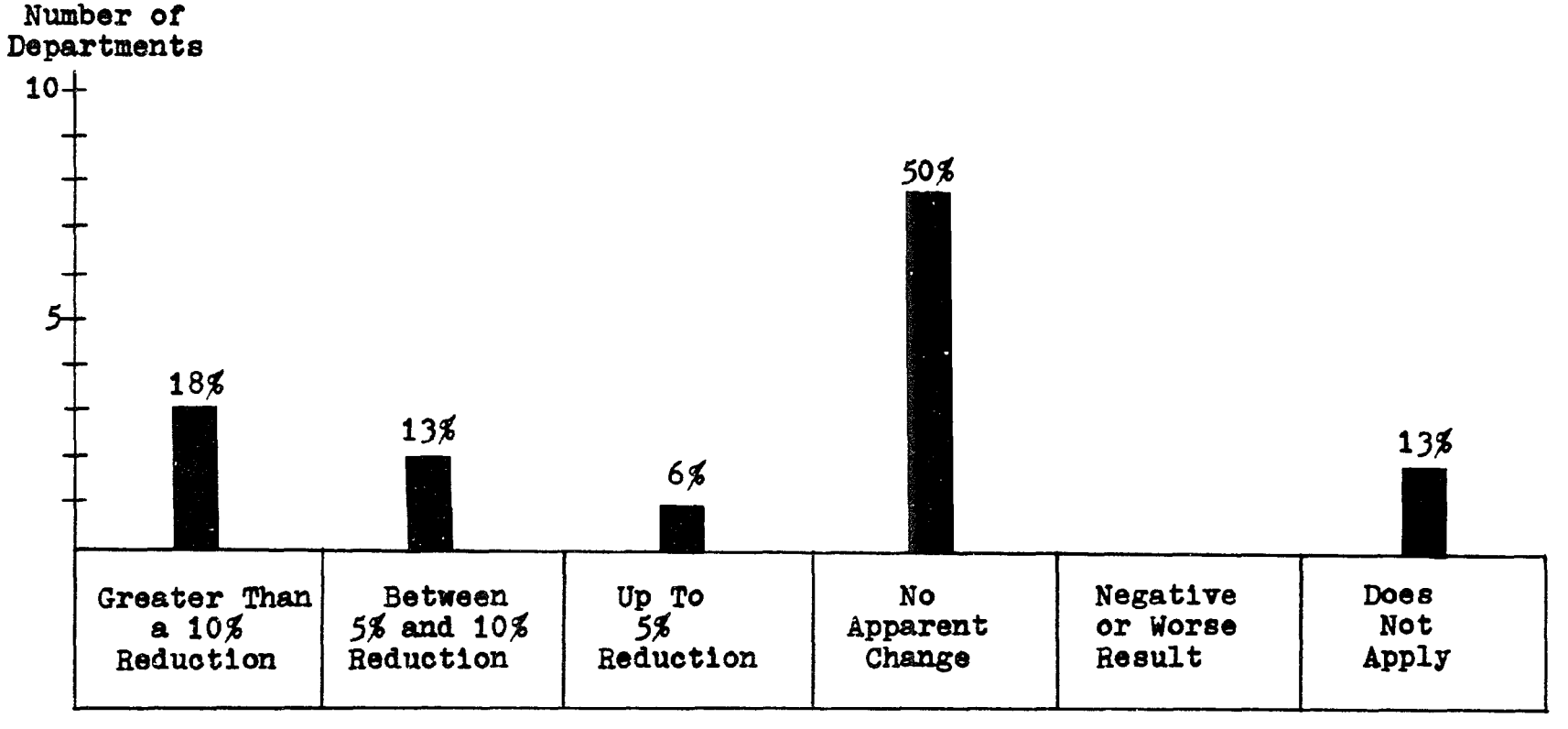
Stock Age

Although closely related to inventory turnover, stock age is examined as a separate measure of inventory management performance. It is possible to achieve improvements in inventory turnover and still have a part of the merchandise inventory unmoved. Improvement in stock age, independent of other changes, results from locating and clearing out inactive goods.

Exhibit 32 lists the results of using automatic data processing in the performance area of stock age. Buyers reported the changes again by categories that indicate the proportionate changes experienced. As shown, eight buyers reported no apparent change in stock age and two buyers reported automatic data processing reports did

EXHIBIT 32

NUMBER OF DEPARTMENTS REPORTING CHANGES IN STOCK AGE FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

not apply to problems of stock age. However, six buyers in total reported improvement: three buyers reported a greater than 10 per cent reduction in stock age, two reported between a 5 and 10 per cent reduction in stock age, and one reported up to a 5 per cent reduction. Although some improvement was indicated, follow-up interviews indicated that stock age is not typically regarded as a major problem area and not subject to separate improvement from inventory turnover. Also, stock age analysis usually done only twice or four times each year which limited the use of this measure as an indication of performance attributed to data processing.

Planning Stock Requirements

Stock requirements planning is an on-going activity that usually peaks at the beginning of each merchandising season. Performance results in this area are recorded for all changes in stock planning whether during or prior to the season. Buyers are asked if the use of automatic data processing reports and records in place of manually prepared reports contributed to an improvement in planning stock requirements. Response choices are:

1. Substantial improvement.
2. Moderate improvement.
3. Slight improvement.

4. No apparent improvement.

5. Negative or worse result.

6. Does not apply.

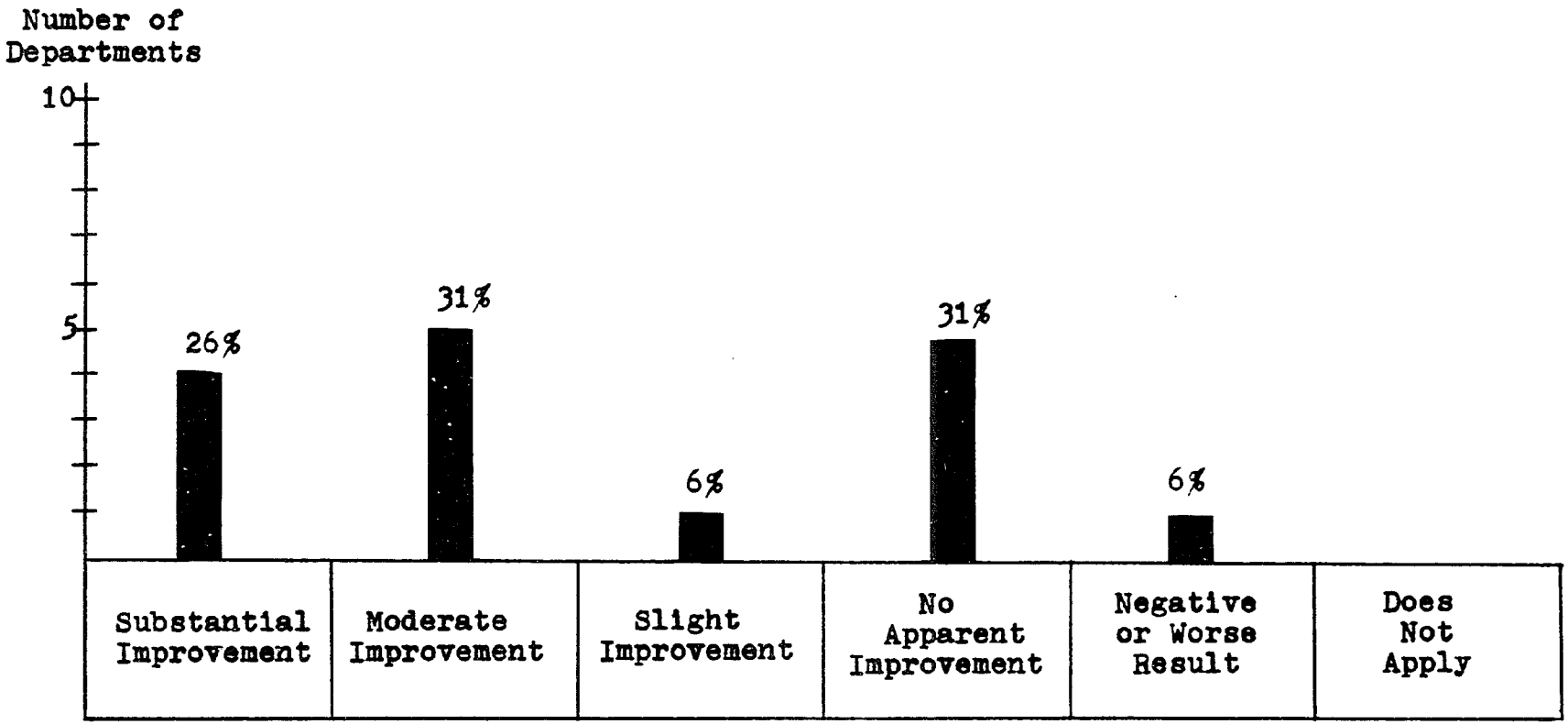
Exhibit 33 shows the number of departments reporting the results of using automatic data processing reports and records in planning stock requirements. Four buyers reported substantial improvement, five buyers reported moderate improvement, and one buyer reported slight improvement. Five buyers reported no apparent improvement and one buyer indicated that automatic data processing had a negative result in stock requirements planning. The reported results in this area are clearly divided into moderate to substantial improvement and no apparent improvement. This pattern suggests that in those sample departments where automatic data processing has aided stock planning the results have been significant.

Identifying Item Movement

The buyers in the sample departments were asked to indicate the degree of improvement in identifying "fast" and "slow" selling items that resulted from the use of automatic data processing based reports. Descriptions "fast" and "slow" were not explicitely made. Generally, "fast" items are those that sell substantially above the planned rate. "Slow" items are those that sell substantially below the planned rate. Also, the number and

EXHIBIT 33

NUMBER OF DEPARTMENTS REPORTING IMPROVEMENT IN PLANNING STOCK REQUIREMENTS FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

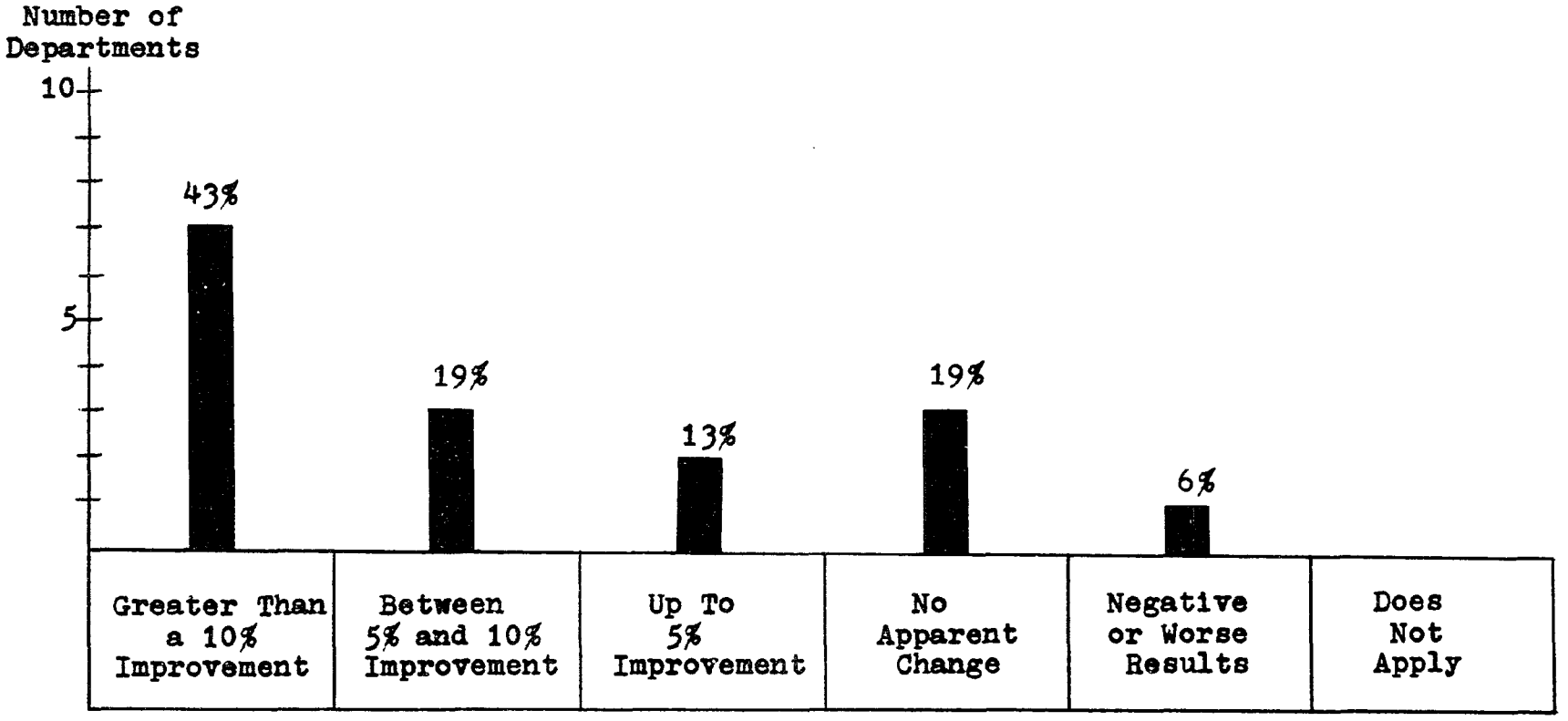
proportion of items in these categories vary widely between departments and stores. The use of automatic data processing is examined without respect to the number of items buyers consider in each category. This measure is intended to determine the results of using automatic data processing to supply actionable item movement information for inventory management. It is expected that successful applications could handle an adequate number of items.

Exhibit 34 shows the number of departments reporting results in the selected categories of item movement. Percentages indicate the proportionate change in the number of items identified as "fast" or "slow." As shown, the bulk of the buyers reported improvement in one of three categories. Seven buyers reported greater than a 10 per cent improvement, three buyers reported between a 5 and 10 per cent improvement, and two buyers reported up to a 5 per cent improvement. Additionally, three buyers reported no apparent improvement, and one buyer reports a negative or worse result.

Although four buyers reported no improvement, the largest number of buyers did report improvement in the area of item movement identification. This performance experience suggests that applications of exception type reporting are potentially a major benefit of automatic data processing based inventory management systems.

EXHIBIT 34

NUMBER OF DEPARTMENTS REPORTING CHANGES IN IDENTIFYING "FAST" AND "SLOW" SELLING ITEMS FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

Controlling Branch Stocks

The number of branch stores in the store sample range from two branches of Store 2 to ten branches of Store 4. In varying degrees, the control of branch stocks is a major problem facing the buyer. In the interviews, a frequently mentioned inventory management problem is the flow of information from branch locations to a centrally located department buyer.

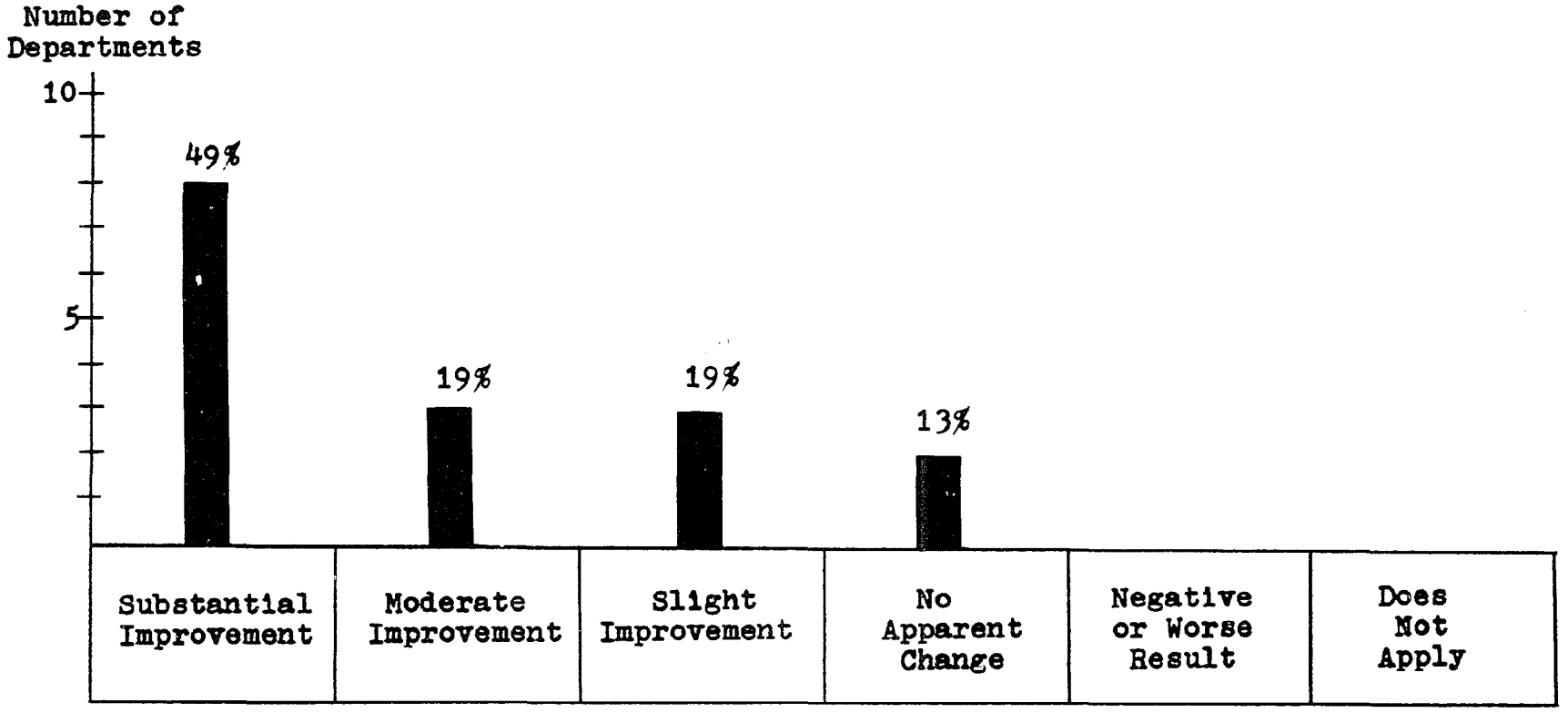
Exhibit 35 lists the results of using automatic data processing based systems in controlling branch stocks. The categories of change are based on differences between automatic data processing reports and the previously used manually prepared reports. As shown, only two buyers reported no improvement while the remaining buyers reported some category of improvement. Eight buyers reported substantial improvement, and three each reported moderate and slight improvement. Of the performance areas studied the buyers reported the greatest help from automatic data processing in controlling branch store inventory. Clearly, control of branch stocks is a successful use of automatic data processing based inventory management systems.

Reasons for Results from Using Automatic Data Processing in Inventory Management

All sample department buyers who use automatic data processing in inventory management were asked to indicate

EXHIBIT 35

NUMBER OF DEPARTMENTS REPORTING IMPROVEMENT IN CONTROLLING BRANCH STOCKS FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

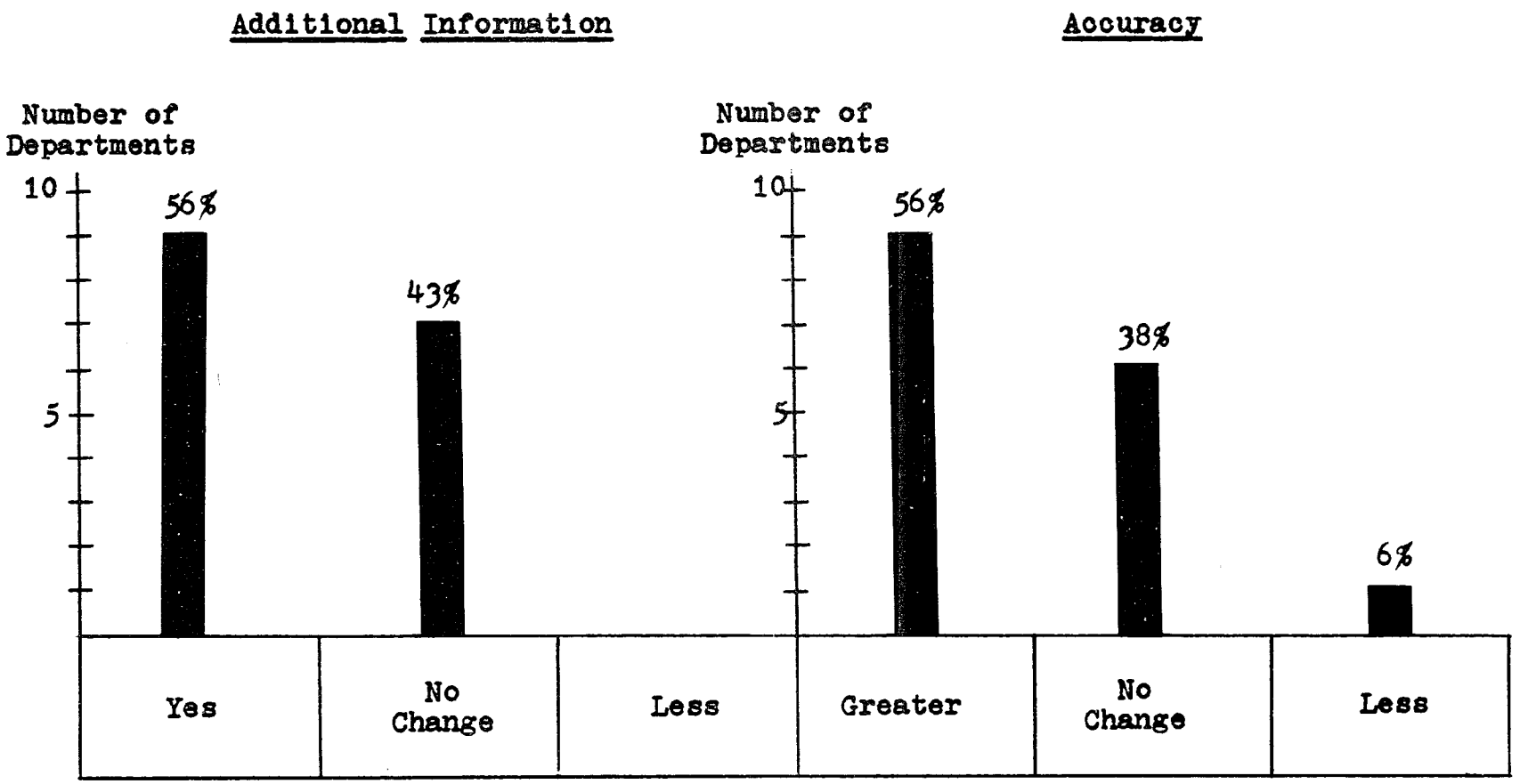
the factors they felt contributed to the overall inventory management performance changes resulting from the use of automatic data processing. The buyers selected appropriate responses for reasons of additional information, accuracy, breakdown of information, and timeliness of information reporting.

Exhibit 36 indicates buyer response in the categories of additional information and accuracy. As shown, nine buyers in each category credited this reason for overall inventory management performance change. Significantly, no buyer reported getting less information and only one buyer indicated that inventory management reports were less accurate. This response is not interpreted as indicating the elimination of accuracy problems, but rather that problems of operational accuracy have been largely resolved.

Exhibit 37 indicates buyer response for reasons of information breakdown and faster information reporting. In the area of breakdown of information, ten buyers reported a better breakdown. The remaining buyers indicated no change. Although not indicated, changes occurred mainly in apparel departments where information such as sales by fabric, pattern, and color that is time consuming and expensive to manually produce was not regularly used. With the capabilities of automatic data processing at their disposal, the buyers in these departments are able to get any breakdown of information they consider useful.

EXHIBIT 36

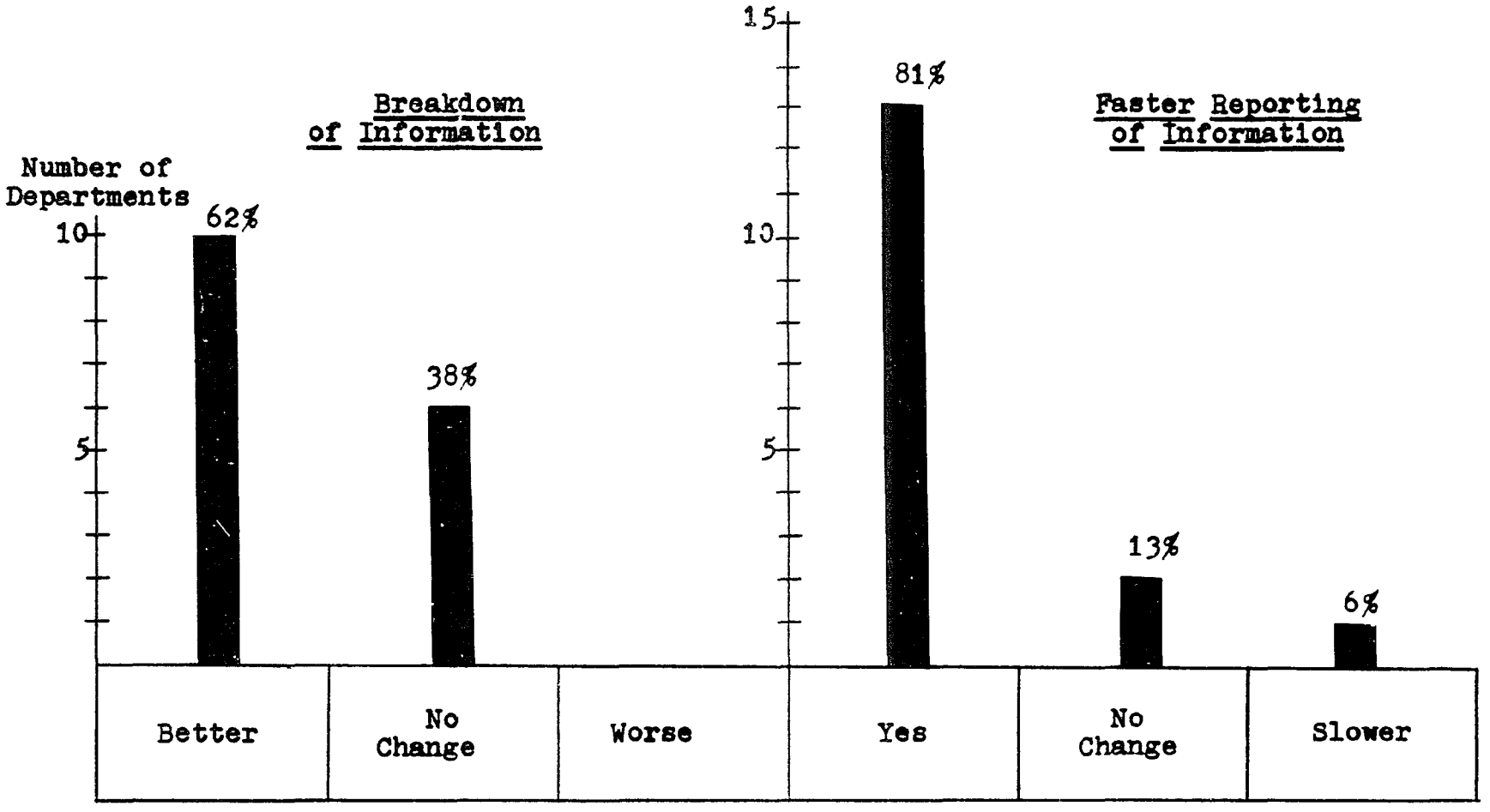
NUMBER OF DEPARTMENTS REPORTING INDICATED REASONS FOR RESULTS FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

EXHIBIT 37

NUMBER OF DEPARTMENTS REPORTING INDICATED REASONS FOR RESULTS FROM USE OF AUTOMATIC DATA PROCESSING IN INVENTORY MANAGEMENT



Source: Questionnaire.

The highest score for any reason is faster information reporting. All buyers except three indicated that faster information contributed to improved inventory management performance. In follow-up interviews, faster reporting of information both from main store and branch locations was the most frequently mentioned advantage of automatic data processing in inventory management.

CHAPTER VII

SUMMARY AND CONCLUSIONS OF THE STUDY

A brief summary and discussion of conclusions is presented in this chapter. In order not to be repetitious with earlier material, the summary is limited to principal areas of study. The conclusions are derived from the findings presented in Chapters IV, V, and VI. Finally, a discussion of the possible uses of the study, areas for further study and comments in retrospect are made.

Summary

The use of automatic data processing for inventory management in the department store sample is an accomplished fact. Each of the five stores studied has an active data processing department and four of the five stores make substantial use of their data processing capabilities for inventory management data processing. Each of the stores planned to expand their data processing capabilities and in the future to add additional departments to present inventory management applications.

The organization position of the data-processing department in three of the five sample stores is in the financial

division. In another store, the data-processing department reports to a separate vice-president. The fifth store does not use automatic data processing in inventory management and the data-processing department is a part of the operating division.

The majority of data processing inventory management systems examined use additional information that was not economically or practically available from the preceding manual system. The manner in which this information was used varied widely among stores in the study. One store produces the bulk of its inventory management reports on a centralized basis. These reports are made available to the buyer in usable form. In contrast, another department store merely processes point-of-sale information centrally and departmental unit clerical employees prepare many reports from these data summaries. The manner in which inventory management reports were prepared showed evidence of earlier procedures. Stores that traditionally processed unit control information in a centralized department substitute computer processing for manual processing. Stores that relied on unit clericals in the individual departments tended to only process inventory management information that cannot be economically summarized by manual methods.

The existing applications of automatic data processing in inventory management in the store sample occur primarily in the ready-to-wear apparel and shoe departments. In the sample, these types of departments used a perpetual inventory

management system. As a result of this, all applications of automatic data processing were adapted to a perpetual inventory system approach. Tests of automatic data processing systems in staple departments using periodic type inventory management systems have not been successful. In these test systems, automatic data processing did not offer cost justified advantages over the traditional methods they replaced.

The use of automatic data processing inventory management and the methods of data collection and input were similar in all the sample stores with inventory management applications. Typical processing activities and reports are grouped into sort-list output and perpetual inventory system output. Sort-list uses of automatic data processing are the simplest and are produced quickly with minimum effort. Perpetual inventory systems maintained by item or style are more complex and require data inputs from several different sources. Increased accuracy over simpler systems is required since the buyer almost totally relies on the book record for evaluating style or item movement and current inventory position.

Examination of the use of automatic data processing, branch store operation, and branch manager responsibility for inventory management indicated a tendency for more branch manager involvement when (1) a larger number of locations are merchandised from the main store departments, (2) automatic

data processing is not used, and (3) merchandise is staple in nature. By contrast, more central control of branch inventory tends to occur when (1) a fewer number of locations are merchandised from the main store departments, (2) automatic data processing is used, (3) merchandise is fashion changeable in nature.

A department profile was developed for each sample department by examining the nature of demand, nature of merchandise, and the buying frequency. The analysis of these factors attempted to isolate inventory management problem criterion that are predictive of automatic data processing use and performance. Although some slight clustering was found, the demand and merchandise characteristics described by the buyers appears to be independent of the automatic data processing applications. In buying frequency, the departments using automatic data processing--on an overall basis--tend to reorder more frequently. It is not conclusively known whether the use of automatic data processing assists in more frequent reorders or it is used in those departments that more frequently reorder.

The use of automatic data processing was compared with the number of resources used and items or styles carried in inventory in each of the sample departments. Changes in these factors within the past one to three years was also considered. Based on this analysis, there appears to be no signigicant relationship between the use of automatic

data processing and the number of vendors and items or styles. In addition, the changes in the number of vendors and items or styles are reported as approximately the same in all departments as in those departments using automatic data processing.

All sample stores using automatic data processing in inventory management reported a higher cost of processing inventory management information by computer, even though additional information often tended to give offsetting advantages. Cost estimates typically included charges for unused time on the computer which tended to penalize present applications rather than providing incentive for additional uses. The sample stores apparently committed themselves to automatic data processing in spite of higher initial costs. These stores are anticipating that the use of automatic data processing will ultimately minimize the costs of managing inventory at the main and multiple branch store locations. No store planned to decentralize inventory management and control of branch stocks.

All stores in the sample acknowledged problems with accuracy of information input to the computer. These problems were largely attributed to limitations of the input medium. Inaccuracies of any type, however, reduce the effectiveness of automatic data processing.

The most advantageous use of automatic data processing reported was in shortening the elapsed time between sale and report of sale. Timeliness of inventory management

reports was one of the significant improvements attributed to automatic data processing by store executives and buyers alike.

Finally, the performance results and reasons for these results were examined. Buyer reports of inventory management performance changes were largely divided between neutral and favorable. Very few negative performance results were reported. Thus, the buyers implicitly indicated that the automatic data processing systems were at least as satisfactory as previous manual systems. On balance, one-half of the buyers responding indicated some degree of improvement from the use of automatic data processing in six areas of inventory management performance. The majority of buyers reported no apparent performance change from the use of automatic data processing in the areas of reducing stock-outs, increasing inventory turnover, and stock age.

The buyers were approximately divided between moderate improvement and no apparent improvement in the area of stock planning; and the majority of buyers found significant improvement in the areas of identifying "fast" and "slow" selling items or styles and controlling branch store stocks. Reasons given for performance changes were speed of reporting, better breakdown of information, additional information, and accuracy in decreasing order of contribution.

Conclusions From The Study

The conclusions from the study of the role of automatic data processing in inventory management apply specifically to the stores selected for this study. These sample stores are representative of large downtown department stores with branch operations and are among the leaders in the industry. It is likely that the bulk of the findings are also conditionally valid for similar large department stores. Excluded would be smaller stores that, because of the restrictive financial and technical requirements, typically do not have automatic data processing installations.

1. In stores using automatic data processing based inventory management systems, this application uses a major segment of the processing capacity. In the sample stores, inventory data processing tends to be second in processing load ranking and would not be expected to be lower than fourth in ranking in the top eight categories of greatest use.

2. The organization position of the automatic data processing department tends to be in the financial division of the department store. This location reflects the processing requirements which are largely financial in nature. The data processing of payroll, sales audit, accounts receivable, and miscellaneous accounting in the sample

constitutes over one-half of the data processing load. Thus, the automatic data processing department responsibility is typically assigned to the division that uses it the most. There is no indication that the data processing department organization location adversely affects the inventory management data processing application. Also, the financial divisions tend to have the responsibility for the systems research group which is available to improve inventory management applications.

3. There is a close correlation between the current use of automatic data processing and the method of inventory management. All uses of automatic data processing in the department sample are in departments which previously used manually maintained perpetual inventory management systems. On this basis, the applications of automatic data processing are more justified and used in those departments that from past experience have found perpetual inventory systems a necessity for sound inventory management. The manual processing alternative to automatic data processing is easier and less time consuming in the periodic system. Two principal items of information: sales rates and inventory position are determined on weekly to monthly periodic time intervals. Perpetual inventory systems, in contrast, are based on daily sales records that are used to produce sales data and to calculate inventory position. In the perpetual method, a larger amount of information must be processed in a shorter

period of time to produce the needed reports. The inherently greater information processing requirement for perpetual systems clearly favors the use of automatic data processing.

4. An automatic data processing based inventory management system that can effectively and economically improve decision making in the staple merchandise departments is not in use in the sample stores. The absence of such an automatic data processing application is due to the lack of a suitable system rather than the lack of data processing capability. Inventory management systems based on a mathematical description of demand have been tested in several departments in several stores and in each case have failed to justify their use. Currently available data processing capabilities provide an incentive for developments of staple inventory management systems, although initial efforts proved to be unusable in the sample stores.

5. Departments using automatic data processing tend to delegate less inventory mangement authority to branch store managers than departments that do not use automatic data processing. The degree of inventory management authority also reflects the number and type of locations merchandised from the main store departments. There is no way that automatic data processing influences can be clearly separated from other factors favoring central control of branch

merchandise. Without suggesting causality, a tendency toward more centralized inventory management is found in conjunction with the use of automatic data processing in inventory management.

6. There is no apparent correlation between the merchandise and customer demand characteristics and the use of automatic data processing in inventory management in the sample departments. The characteristics of the departments using automatic data processing are not significantly different than those departments not using automatic data processing. Thus, these factors are not visibly a determinant of automatic data processing applications.

7. There is a tendency for a slightly higher number of reorders to be made in those departments using automatic data processing in inventory management than those that do not use it. A causal relationship between reorders and automatic data processing can only be suggested on the basis of limited evidence. Because of the absence of a noticeable relationship between the use of automatic data processing and other characteristics of merchandise and customer demand it is likely that automatic data processing is a cause rather than the result of more reorders. Further, reported results in the area of recognizing items for possible reorder support this hypothesis.

8. An examination of the number of items stocked and the number of resources used indicates no significant relationship between these factors and the use of automatic data processing. Also, changes in items stocked and resources used by department within the past three years are not significantly different between departments using automatic data processing and all sample departments.

9. The inherent accuracy of automatic data processing is not fully apparent in inventory management systems in the sample stores because data input methods are currently less accurate than the computer equipment. Since system accuracy is not better than the weakest link, the full advantage of increased data processing accuracy has not been realized.

10. The cost of processing inventory management information by automatic means is reported as greater in all sample stores than the manual methods which were replaced. In spite of higher reported costs, all stores are firmly committed to an automatic data processing program. An absolute cost comparison is not possible because most automatic data processing inventory management systems supply additional information not previously available. In addition, the sample stores charge the full cost of the computer installation to current applications and these costs often include charges for non-use and testing time. Conclusive analysis of economic performance would require cost

estimates for all additional information supplied and a re-examination of processing time charges for inventory management information. The needed information for this type of analysis was not available from the sample stores.

Based on store reports that automatic data processing inventory management systems are expected to be cost justified in the near future, a guarded estimate is made that under the outlined method of cost analysis economic justification already exists in three of the sample stores.

11. The main areas of inventory management performance improvement from using automatic data processing, in decreasing order of importance, are improved control of branch stocks, identifying item movement, and planning inventory requirements. These results are largely due to faster reporting of information, improved breakdown of information, and the availability of additional information possible with automatic data processing systems.

12. The advantageous use of automatic data processing in department store inventory management depends significantly upon the quantity of the data needed for inventory decisions and the importance of the elapsed time between sale and report of sale. At present, periodic inventory management systems covering several branch locations are the principal applications that fit into this guideline.

Study Uses

The uses of this study and its implications are many for department store executives, system analysts, computer manufacturers, and teachers of retailing.

For department store executives, the extent of the contributions of computer based inventory management systems reported by the buyers provides perspective that often seemed to be missing in the store interviews. One store can compare their experience to reported findings as a basis for bringing additional information to bear on problems of automatic data processing applications. For executives of smaller stores that are not troubled by branch store inventory management and timeliness problems in data processing, a recognition that costly automatic data processing may be limited in its usefulness is possible.

Data processing system analysts should be interested in the reported results and reasons for results of using automatic data processing in inventory management. Also, those analysts who are unaware of the results of many staple inventory management tests would be alerted to potential problems. Current trade literature often touts potential applications of a staple inventory management system, yet in the store sample tests were not favorable. The system analyst may be interested in the lack of correlation between data processing applications and the characteristics of the inventory management problems reported by the buyers.

Theoretically, the inventory management problem characteristics should be a key factor.

The computer manufacturer would be interested in the reported benefits of computer based inventory management systems. Often, the manufacturers of equipment do not come into direct contact with the buyers and conceivably do not have a comprehensive report on the buyers' reaction to the use of computer based inventory management reports. The extremely important systems development implications from the many uses of a typical large department store's computer facilities should alert to or confirm the importance of system performance rather than computer performance alone. The manufacturers of computers should be interested in the concept of determining application characteristics that favor the use of computer based inventory management systems. Since inventory management is a major application in the sample stores, information that would aid in the development of successful inventory management applications is an important adjunct to computer sales.

Finally, the teacher of retailing would be interested in all the areas of the study. A teacher who is relatively current on data processing based retail inventory management would be aware of several findings indicated, however, this study can provide a source of comparative information. In the areas of relative processing load and performance reported by the buyer, a clearer understanding of the role

of data processing is hopefully supplied. In its overall form, this study is targeted primarily to researchers and teachers of retailing.

Areas For Further Study

Three suggestions for further study are made in areas where questions basic to improved understanding of retail inventory management are apparent.

The first suggestion for further study is an enlarged examination of this same type that would include all large department stores and a representative group of medium sized ones in the five to fifty million dollar annual sales volume category. This enlarged sample would yield results with a higher degree of reliability, but not necessarily different results. A study of this size would require substantial financial and trade association support.

Second, a fruitful area of study is the apparent lack of relationship between the use of automatic data processing in department store inventory management and the characteristics of the inventory management problem. In theory, the nature of the inventory management problem is a key variable in the successful use of specific inventory management techniques. An examination of both inherent characteristics of the inventory management problem and a currently used inventory management system, in respect to the use of automatic data processing, would provide valuable information

for evaluating and selecting successful future applications.

Thirdly, an important area for study is the suspected substitution of computer based inventory management systems for decentralized responsibility of branch stocks. An examination of other variations due to store policy, capability of personnel, and the inventory management problem structure needs to be made so that the effect of data based inventory management in the branches is placed in a clearer perspective.

Retrospect

The development and use of automatic data processing in the department store sample provided both incentive and means for improvements in inventory management. The trend toward data based inventory management systems was likewise both a cause and result of the use of automatic data processing.

Problems of data input and the lack of a suitable staple inventory management system pose formidable barriers to the wide use of automatic data processing in all departments. The resistance of many buyers to rely on centralized inventory data processing and decentralized branch store management has affected the use of automatic data processing. Another problem results from the apparent committment to automatic data processing for its innovation value often in spite of questionable economic justification. After this committment, the stores in the sample tended to charge the full cost of the computer operation to those activities using the computer facilities. The charges often included cost allocations for idle time, computer testing time, and unreimbursed down time.

The analysis of automatic data processing based inventory management systems separate from the use of the computer is difficult since the system is an inherent part of the data processing use. In an absolute sense, all inventory reports and data preparation can be made manually, but many new systems and reports are not seriously considered

until data processing capabilities are available. In addition, many systems that now require the use of automatic data processing bear resemblence to traditional methods. Typically, new systems evolved from old systems in the adaption of inventory management data needs to computer processing.

Changes in inventory management are also caused by a shift from visual and intuitive methods to a more data oriented approach. This change has been taking place actively since 1950--well before the widespread use of automatic data processing. An equally important change is occurring in the nature of retailing. In the aggregate, these changes markedly affect the development of inventory management methods.

Within the overall sphere of change, the development and use of automatic data processing in inventory management performance is inextricably linked to accurate data, effective use of reports, merchandising goals, and sound planning. A computer can provide needed support for improving inventory management performance, but not alone. Problems of data input, buyer use of reports, inventory management systems, and cost must be solved concurrently with automatic data processing application problems.

APPENDIX A

INTERVIEW WORKSHEETS

BACKGROUND INFORMATION

Operating Characteristics

1. Store Organization Structure. Indicate the major positions, chain of command, and the basic departmental responsibilities for the following segments of the store's organization structure.

   a) Organization structure of the merchandising divisions of the main store.

   b) Organization structure of the divisions of the branch stores.

   c) Organization position of the data processing section.

   d) Organization of the presently or previously used manual unit control departments where they are centralized and have a separate identity from the merchandising departments.

2. Branch Stores. List the branch stores operated by the parent store

3. Branch Store Characteristics. Indicate the nature of the branch stores. Indicate whether they are basement type stores, budget type stores, full line branches, or selected line branches, and related information.

Automatic Data Processing

1. Central Data Processing Equipment. Manufacturer and model and other suitable identification of the central processer.

2. Data Input Equipment. Manufacturer and model and other suitable identification of input equipment.

   a) Register sales reports.
   b) Stock counts or other physical inventory data input.
   c) Print-punch ticket of other unit control data input.
   d) receiving reports and incoming inventory inputs.
   e) Stock transfer information.
   f) Other.

3. Other Peripheral Equipment.

4. Data Processing Equipment Usage. Assigning processing usage times for each major activity and ranking according to time required for a normal data processing load. Most frequent usage numbered 1. Indicate those activities not being used also.

a) Payroll
b) Accounts Receivable
c) Accounts Payable
d) General Accounting
e) Financial Reporting
f) Sales Audit
g) Personnel Records
h) Merchandise Control, open-to-buy, and other similar activities.
1) Other (specify)

5. Future Data Processing Capacity.

a) Is any additional data processing equipment being added in the next year?

b) Are there any additional inventory management applications being added within the next year?

c) Will these changes affect the data processing usage ratings?

DEPARTMENT IDENTIFICATION

Merchandise	NRMA	Store Code	Manager
Negligees & Robes	38-12		
Women's Better Shoes	39-21		
Women's & Misses Dresses	42-31		
Formals & Bridals	42-33 42-42		
Better Blouses	43-21		
Women's Inexpensive Shoes	39-23		
House Dresses	45-11		
Men's Furnishings	51-11 53-12		
Blankets	15-12		
Corsets & Brassieres	36-00		
Hosiery	37-00		
Linens	15-11		
Cosmetics	22-11		
Drugs & Drug Sundries	22-12		
Housewares	66-11		

USE OF DATA PROCESSING

Merchandise	NRMA	Store Code

1. Data Inputs:

2. Processing:

3. Reports:

4. Reason For Use Rating:

   a) Economy:

   b) Accuracy:

   c) Time requirements:

   d) Other:

REPORT ELEMENT CHECK-LIST

Report Elements	Reporting Frequency	Method of Processing
Period Sales		
Period-to-date Sales		
Period Last Year Sales		
Sales/Square Foot		
Sales/Dollar of Inventory		
Sales by Price Line		
Sales by Classification		
Sales Forecast		
Period open-to-buy		
Sales by Vendor		
Unit Sales by:		
Size		
Color		
Style		
Fabric		
Pattern		
Vendor		
Other		
Gross Margin		
Period-to-date Gross Margin		
Period Last Year Gross Margin		
Gross Margin by Vendor		
Gross Margin/Square foot		
Inventory Turnover		
Stock Age		
Period Markdowns		
Period Last Year Markdowns		
Period-to-date Markdowns		
Current Inventory Position		
Returns and Credits		
Period Purchases		
Receiving Reports		
Cancellations and Returns		
Purchase Order Adjustments		
Merchandise Transfers		
Other		

APPENDIX B

QUESTIONNAIRE

QUESTIONNAIRE

DEPARTMENT AND CLASSIFICATION PROFILE

STORE _____

DEPARTMENT MERCHANDISE _____

DEPARTMENT NUMBER _____

DEPARTMENT BUYER _____

To Department Buyer:

With the approval of the Research Department, I am conducting a study dealing with inventory management and control in department stores.

Your department has been selected as one of 16 that is being examined as part of this study. Your cooperation is solicited in answering the attached questionnaire and returning it to me in the envelope supplied--if possible within one week.

Where specific information cannot be determined from records, buyer estimates should be used.

Respectfully,

David McConaughy

David McConaughy
Assistant Professor of Marketing
Eastern Michigan University

Completed by _____ Title _____

Date _____

1. a) Average number of items carried in department? _____

   b) Within the past 1 to 3 years has this number:

   Increased _____
   Remained the same _____
   Decreased _____

2. a) Average number of classifications in department? _____

   b) Within the past 1 to 3 years has this number:

   Increased _____
   Remained the same _____
   Decreased _____

3. a) Average number of classifications for which sales information is separately reported? _____

   b) Within the past 1 to 3 years has this number:

   Increased _____
   Remained the same _____
   Decreased _____

4. a) Average number of items for which sales by unit is recorded at point-of-sale with tickets or other means? _____

   b) Within the past 1 to 3 years has this number:

   Increased _____
   Remained the same _____
   Decreased _____

5. a) Average number of classifications for which price line information is reported? _____

   b) Within the past 1 to 3 years has this number:

   Increased _____
   Remained the same _____
   Decreased _____

6. a) Average number of resources used? _____

b) Within the past 1 to 3 years has this number:

Increased _____
Remained the same _____
Decreased _____

7. Number of different selling locations for merchandise purchased by this department?

a) Main Store (Including shops within the main store) _____

b) Branch Stores _____

8. Select the following statement that best describes the function of the branch department manager.

a) Advisory Relationship Branch manager does little more than coordinate plans developed by the main store buyer. _____

b) Partial Responsibility Branch manager makes specific recommendations that are usually adopted, although he does not have final authority over branch stocks. _____

c) Partial Authority Branch manager has limited authority over branch stocks. He may requisition stock from pool or warehouse inventory. In some instances he may reorder from a resource subject to appropriate controls. _____

9. The following question is designed to give a brief description of the nature of the merchandise in the department. Indicate the number of merchandise items that are described by each of the following categories. Total of the three categories is equal to all items in the department.

a) Merchandise items are fashion perishable and would not normally be carried from one season to the next as their continued popularity is not assured. _____

b) Merchandise items have a distinct fashion element, although styles do not usually change each season. Style life is varying in length, but the majority of offerings last for more than one season. Most items are partially fashion perishable. _____

c) Merchandise items are considered staple. Changes in product offerings are made slowly and inventory obsolescence is not a major problem. Merchandise is likely to be in year around demand, although selling peaks occur. A number of these items would be considered "never out" items. _____

Total of all items in department = [ ]

10. The following question is designed to give a brief description of the nature of customer demand. Indicate the number of merchandise items that have demand described by each of the following categories.

a) Demand is largely uncertain. Unit sales forecasts cannot be made with an appreciable degree of accuracy because of widely fluctuating demand or because product offerings are new and historical demand data is not available. _____

b) Demand is somewhat predictable but fluctuates widely from unit forecast. Demand prediction provides a guide-line, although significant variations are expected. Historical demand information for these or similar items provide a basis for estimating future demand. _____

c) Demand is predictable to the extent that unit sales plans are largely realized. Future demand can be estimated within relatively narrow limits. Product sales have continued over several or more years, thus providing ample data for basing forecasts. _____

Total of all items in department = [ ]

11. The following question is designed to give a brief description of the nature of the buying frequency of the merchandise items in this department. Indicate the number of merchandise items described by each category.

a) Merchandise items are not or cannot be reordered during the merchandising season. Items may be tested preseason, but after a full stocking commitment is made no further orders are received. _____

b) Merchandise items are reordered once or twice during the merchandising season. Items may be tested preseason, but after a full stocking commitment is made no more than two reorders are received. _____

c) Merchandise items are reordered more than twice during the season as needed. Ordering would include continual purchase of items that are stocked on a year around basis. _____

Total of all items in department = [ ]

RESULTS OF USING AUTOMATIC DATA PROCESSING

The following section is designed to determine the results of using automatic data processing in inventory management. The questions are directed to those changes that have occurred since automatic data processing information such as IBM reports, print-punch ticket reports, and other computer prepared reports have been used. While dates are not specified, the past 1 to 3 year time period is suggested as the basis for comparison. Answers should be based on the buyer's judgement of results supported by available facts.

1. Has the use of IBM reports in place of manually prepared reports and records helped reduce the number of "stock-outs" in the department?

Greater than 10% reduction _____
Between 5% and 10% reduction _____
Up to 5% reduction _____
No apparent change _____
Negative or worse result _____
Does not apply _____

2. Has the use of IBM reports in place of manually prepared reports and records helped increase the sales to beginning-of-month inventory ratio in the department?

Greater than 10% increase _____
Between 5% and 10% increase _____
Up to 5% increase _____
No apparent change _____
Negative or worse result _____
Does not apply _____

3. Has the use of IBM reports in place of manually prepared reports and records helped reduce stock age in the department?

Greater than 10% reduction _____
Between 5% and 10% reduction _____
Up to 5% reduction _____
No apparent change _____
Negative or worse result _____
Does not apply _____

4. Has the use of IBM reports in place of manually prepared reports and records contributed to an improvement in identifying fast and slow selling items?

Greater than 10% improvement _____
Between 5% and 10% improvement ____
Up to 5% improvement _____
No apparent change _____
Negative or worse result _____
Does not apply _____

5. Has the use of IBM reports in place of manually prepared reports and records contributed to an improvement in planning stock requirements in the department?

Substantial improvement _____
Moderate improvement _____
Slight improvement _____
No apparent improvement _____
Negative or worse result _____
Does not apply _____

6. Has the use of IBM reports in place of manually prepared reports and records contributed to an improvement in controlling branch stocks?

Substantial improvement _____
Moderate improvement _____
Slight improvement _____
No apparent improvement _____
Negative or worse result _____
Does not apply _____

7. In the previous 6 questions have the changes (if there were any) from the use of IBM reports resulted from:

a) Additional information that was not available from manual methods of reporting information - Yes___ No change___

b) Greater accuracy of information - Yes___ No Change___

c) Faster reporting of sales and stock information - Yes___ No change___

d) Better breakdown and presentation of sales and stock information - Yes___ No change___

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