

THE APPLICATION OF ELECTRONIC DATA  
PROCESSING TO DEPARTMENT STORE  
RETAILING

by

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## ABSTRACT

The primary purpose of this thesis is to investigate the problems involved in adapting electronic data processing equipment to aid the fashion merchandising departments of retail department stores. In order that this application is placed in its proper perspective, it is also necessary to delve into some of the more fundamental concepts underlying the management planning and control function, to emphasize the relationship of management science methods and electronic data processing equipment to business problems in general, and to survey the operating characteristics of retail stores and the problems they face when introducing electronic data processing equipment. Preceding the discussion of the fashion merchandising application is a chapter on the organization of retail department stores that promotes a better understanding of the institutional framework within which one is working.

Both primary and secondary research were undertaken to obtain the required information. The rather sparse literature published on this topic in the retailing field was supplemented by interviews with numerous retail executives of the four major department store chains in the Greater Vancouver area. Relevant literature from other fields of business was also

brought into the discussion.

This thesis supports the wider use of electronic data processing equipment to solve the increased data handling problems that have been experienced by retail department stores. In addition it is felt that this equipment can play an important role in providing merchandising personnel with information that could lead to improved performance of their functions. However, a greater improvement in performance in fashion merchandising, and in fact all retailing areas, will be realized when there is a more precise definition of the information required and when data handling systems are designed accordingly.



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## CHAPTER I

### INTRODUCTION

The two decades following the end of the Second World War have witnessed the birth and accelerated development of equipment and concepts that vitally affect management. The electronic digital computer and its associated peripheral equipment, which in this thesis are collectively called electronic data processing (EDP) equipment, constitute the heart of modern data processing systems. From its beginnings as a tool used by atomic scientists, the applications of EDP equipment have expanded to encompass many academic disciplines and to help solve many practical problems, business problems included. This equipment contains vast potential for improving management decisions and extending management control.

Retailing, and in particular department store retailing, is a dynamic business--ever growing, ever changing. The development of retailing as a whole and of individual units and stores within the broader marketing scene has been, and will continue to be, influenced by such basic trends as the growth and distribution of population, national income, and personal income, the degree of industrial dispersion, the increasing costs of labour, and the relative development of institutional units (i.e. department

stores, branch stores, discount houses, mail order houses).

However, retailing is not only a dynamic business. It is also one that is faced with great diversity in accomplishing the job of distributing merchandise and typically has been noted for its decentralization in which large numbers of executives determine policy within their respective spheres. Through its reluctance to standardize, retailing has not benefitted from the development of EDP equipment to the same extent as have such industries as manufacturing, utilities, and insurance. With the exception of the cash register, until quite recently, there had been little, if any, equipment which had been specifically designed for retailing. The approach in retailing has been to adopt business machines developed and built to meet the requirements in other kinds of businesses. Retailing is only now beginning to feel the impact of machines which were designed to curtail or eliminate paper-work steps that make retail accounting costly and inefficient. Using these machines designed more with retailing needs in mind, retailing is attempting to find methods best suited to its circumstances that will aid in integrating, coordinating, and reducing the paper work incidental to the job of distributing merchandise to the consuming public.

Retailing data handling problems have, in the last decade, undergone a tremendous expansion. Concurrent with this trend has been increased competition, falling net

profit ratios, and a gradual outmoding of accounting systems not adapted to the more dynamic conditions. The net effect is a growing concern over the paper bottleneck created in operations and the recognition of the need to provide retailing management with better information to aid them in performing their duties. Herein lies the problem of this thesis.

## I. THE PROBLEM

### Statement of the Problem

It was the purpose of this thesis to set a potential merchandising application of EDP equipment into the broader context of EDP equipment as a tool of management in general. As reflected in the thesis development, the problem is narrowed down from a broad view of business organization and the problems involved in making business decisions to the discussion of the types of information that might be helpful for making decisions in a particular merchandise area (i.e. fashion merchandise) of a particular type of marketing institution (i.e. department stores) which operates within one segment of the broader institutional framework of business.

### Importance of the Study

EDP equipment is a collection of physical apparatus whose relationship to management practice and whose power



in application depends on the theoretical and practical knowledge associated with its use. Once the equipment has been acquired the problem becomes one of effectively relating management needs to these man-machine systems. This, in turn, requires that one have a firm grasp of the problems involved.

Retailing has lagged, relative to other industries, in the application of EDP equipment. Because of this lag, the literature available today on retailing applications is quite sparse. To the author's knowledge little has been written which might be termed a comprehensive approach to the problem. The attempt in this thesis, is to come to grips with the problems in applying EDP to retailing while at the same time drawing on pertinent experience gained outside the field of retailing itself. The efforts have been restricted largely to department stores because problems of equipment cost and lack of information limit the application and study outside this area.

## II. THESIS ORGANIZATION

Chapter II through Chapter V constitute the main text of this thesis. The content of Chapter II represents considerations which are very basic to a broad understanding of the role of the computer in relation to the general field of business management and introduces concepts which are germane to the development of the entire

thesis. The three theories of management which are briefly reviewed in the chapter were thought to be useful in orienting one's thinking regarding the decisions and administrative problems faced by management in large organizations. All three points of view contribute to a wider understanding and are explicitly and implicitly referred to later in Chapter II and the remainder of the thesis.

The section investigating decision making in the firm draws heavily on literature which was written by people more familiar with problems in business areas other than retailing. However, the conclusions reached are by no means irrelevant to the general development of the thesis. By studying some industrial history that is introduced, for example, one gains an awareness of the relationship between the span, the degree of inherent structure, and the variability of decision making at different levels in organization structure. These relationships are as applicable to department stores as they are to the large industrial concern. The incompatibility of classical micro-economic theory is expanded on because, as pointed out, the limitation on the information available to the decision maker detracts from the degree of structure of a decision and therefore hinders him in using the theory as a guide to practical policy formulation. The nature of computer operation dictates that a considerable degree of structure and stability of problem structure exist to make the

expenditure of time and effort in detailed programming worthwhile. The discussion of the general characteristics of organizational decisions, such as the decreasing degree of structure possessed by economic problems as one proceeds upward in organization, provides a clue as to the most probable areas of application for the computer and scientific methods.

Finally, the chapter investigates the relationship to business of the branch of management theory known as management science. The previously mentioned inadequacy of classical micro-economic theory as a rational guide to policy decisions and economic decisions in general, has resulted in the development of management science tools for decision making purposes. This body of knowledge is highly relevant because it is these concepts which now, and in the future, provide the means to supplement and enhance the use of computers in business. Due to the great complexity of calculation involved in using these mathematical methods, a computer is usually necessary in order that the techniques be of practical use to management. Knowledge of these scientific techniques is useful to provide a background in the study of EDP methods despite the fact that the particular application investigated in this thesis, namely, fashion merchandise control, did not lend itself to the use of these methods.

Chapter III undertakes a comparison of traditional methods of organizing department stores, as embodied by the Mazur Plan, and the variations from this plan found in stores of the greater Vancouver area. This comparison serves two main purposes. The discussion provides one with an understanding of the interrelationship that exists between the various activities carried on in a department store. These activities must be organized and coordinated to further the aims of the store as a whole. Secondly, the discussion helps one to superimpose the organization framework of the department store on the concepts introduced in Chapter II. The descriptions are, of necessity, general because obviously the detailed specification of authority and responsibilities within organizations depends on the abilities of the people in the organization and on the situation details. The understanding of department store organization is a prerequisite to an understanding of the application of electronic data processing in retailing discussed in Chapter IV and Chapter V.

In Chapter IV, before investigating retailing as a problem area in EDP application, the description of the functional components of an EDP system is undertaken. Although this section could conceivably have been included in Chapter II, the close connection between those functional components and details of the design of retail systems is such that the discussion lends itself better to Chapter IV.

The investigation of the characteristics of retail data processing, the objectives of management in acquiring EDP systems, and the present retailing applications of EDP serve to bring the reader abreast with retail data-processing developments. The last section of Chapter IV highlights the relative lag of retailing in adopting EDP methods and suggests some reason for the present state of affairs.

Chapter V, the final chapter of the text proper, investigates the relative lag within retailing institutions in the application of EDP to merchandising functions. Fashion merchandising, primarily because of its relatively large dollar volume and high risk of lost profit, is further singled out as a potentially fruitful area of application. The salient characteristics of fashion merchandising, the weaknesses of present unit control systems, and the reasons for the lack of EDP applications in merchandise control are briefly reviewed. Finally, in this chapter, recognizing that the scientific management models earlier mentioned were not at present applicable to fashion merchandising, suggestions are made regarding the type of information that might be made available to various merchandising personnel to usefully aid them in making their decisions.

### III. SOURCE DATA AND METHODOLOGICAL CONSIDERATIONS

The source material used in the preparation of this

thesis was derived from both primary and secondary research. The secondary research material consisted of the few, reasonably up-to-date text books in the field supported by periodical literature which carried articles relating to the topic. The text books were used to gain some understanding of the basic principles of retail merchandising while the periodicals frequently provided more detail and expanded on the evolving concepts in retailing.

The primary research consisted, for the most part, of conversations with representatives of four large department-store chains located in the Vancouver area. In addition, interviews were held with two representatives of local organizations which merchandise ladies fashions, and with a local representative of an EDP equipment manufacturer. This research was used to learn about the organizational structure of local stores, current progress and problems experienced in applying EDP methods to retailing, and current practices in merchandising. The primary research was also designed to support or dispute the broad generalizations which were frequently made in the retailing books. At the request of the persons interviewed, paraphrased material does not include reference to their names or to the organizations with which they are affiliated.

## CHAPTER II

### THE COMPUTER AND THE MANAGEMENT REVOLUTION

#### I. THE MODERN BUSINESS SETTING

##### Management in Transition

The last decade and a half has been marked by a noticeable intensification of interest in the problems fostered by the growing pains of business. Academically, there has been considerable interest shown in conceptualizing some of the basic principles of business operation. However, a scatter-gun approach to the problems has yielded numerous abstract theories and techniques but as yet has failed to approach any semblance of an integrated body of theory. As a result, scepticism exists in the mind of the practical businessman as to the true merits of the new ideas introduced.

The modern large-scale business organization raises complex problems for the administrative theorist who attempts to reconcile economic aspects of business with the personal element, rationality in decision making with empirical studies of actual processes and, more generally, theoretical concepts with practice. The decision-making process in large-scale organization has, without doubt, become increasingly difficult as more and more persons

participate in it. Information for decision making is prepared by employees below the decision-making level and through their actions these people can bias the information submitted to the decision maker, thus, unconsciously gaining an extraordinary influence on decision making. At the same time, business historians have traced a trend in modern organizations which indicates that those who have ultimate authority and make final and strategic decisions have become increasingly remote from the daily operation of their enterprise. In light of the evidence, clearly the need exists to re-examine and analyse the basis of organizational, group and individual decisions.

Notwithstanding the fact that the discipline of economics has served as a basis for so much business theory, the inadequacy of this theory as a rational guide to policy formulation is pointed out. Psychological evidence tends to support the need for analytical models to provide guidance for management decisions.

In summary, the purpose of this chapter is to survey some of the characteristics of organization and the new expanding field of theoretical knowledge related to it. Direct or indirect reference will be made to what are the prime management functions in business, that is, the functions of planning, organization, staffing, motivation and control. Above all else, the purpose here is to provide a perspective for viewing the electronic digital computer against the



broad backdrop of some newer concepts evolving in management theory. Before narrowing down our considerations to retailing and, in particular, to merchandising applications as will be done later, it is felt that emphasis should be given the computer as just one of a number of new tools now available to management, thus promoting a broader understanding of its place in the growing body of administrative theory.

### Theories of Management

The business organization may be simply thought of as a network of relations between investors, customers, managers, employees and suppliers. These relationships have been variously interpreted from the functional approach (i.e. marketing, production, finance, etc.), the formal organization approach (i.e. line and staff, centralization and decentralization, etc.), and the legal approach. For the purposes of this section, we shall introduce the question from three points of view. These orientations will be provided by economic-accounting, the behavioral theory, and control or feedback system theory.

Managers have frequently been characterized by their essential role as decision makers in organization. In our hypothetical communication system, a manager is considered an information converter at some control point in the organization. The manager selects certain classes of

information sources, combines and processes these information flows and subsequently produces streams of managerial decisions that control actions within the organization. Though each manager has available a large number of information sources, poor decisions can be made through using only a small fraction of available information and making only incomplete and erratic use of the information selected. Management success, therefore, depends primarily upon what information is chosen and upon how the information is translated into action.

This initial view of the firm as an interlocking network of information channels is basically an economics and accounting orientation to the firm. The channels of information emerge at various points where the decision maker uses this information to control physical processes. Culliton,<sup>1</sup> by using a hydraulic analogy, diagrammatically illustrates the control and planning functions of management as they relate to balance sheet and income-statement classifications.

However, the student of administration has a broader interest in the differences that organizational structures introduce to this information system and in the effects of the human element. These two aspects fall within the realm

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<sup>1</sup>J. B. Culliton, "Diagram of Management Control," Harvard Business Review, 38:144-150, March, 1960.

of a discipline labelled "The Behavioral Theory of the Firm" which builds upon organizational and behavioral concepts. The behavioral scientist who draws on theories from social psychology, sociology and anthropology looks at the business firm as a social or sociological institution. He is particularly interested in the situations that are created from the interactions of people--how people form groups, how attitudes are formed or changed, how aspiration levels are affected, etc. Quite obviously, the information system cannot be considered apart from these factors since people are an integral part of the information system.

Modern organization theory, which is based on the contributions of men like Barnard,<sup>2</sup> Simon<sup>3</sup> and March,<sup>4</sup> has concentrated upon decision making as the basic element in studying any organizations. The information system of the organizational theorist is broader than that of accounting systems since it embodies the transmitting of information about the premises of relevant persons and their "feelings" or responses" as well as the quantitative data upon which they are to operate. It may also involve bias in the

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<sup>2</sup>C. I. Barnard, The Function of the Executive (Cambridge:Harvard University Press, 1938).

<sup>3</sup>H. A. Simon, Administrative Behavior (New York: MacMillan, 1957).

<sup>4</sup>J. G. March and H. A. Simon, Organization (New York: Wiley, 1960).

transmission of information. In addition, organizational theory has stressed the importance of the hierarchy in an organization, including the related concepts of authority and responsibility. In total, therefore, the "Behavioral Theory of the Firm" is simply a series of studies which attempts to extend the classical economic theory of the firm by including organizational and behavioral concepts.

Control system or feedback-system analysis represents the final body of knowledge which is of interest to us.<sup>5</sup> This area has been most extensively studied by electrical engineers but certainly the basic concepts of information feedback control are fundamental to all life and human endeavour. The principles involved have, in fact, been used directly or indirectly by other disciplines although engineers, by virtue of their analytical study of the field, are most closely identified with it. Quite simply, an information feedback system exists whenever the environment leads to a decision that results in action which affects the environment. To cite a practical example, the manager of a company uses information about conditions he hopes to influence or control to make decisions. These decisions he expects will result in action which will have an effect upon future values of information he is using.

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<sup>5</sup>C. D. Flagle and others, Operations Research and Systems Engineering (Baltimore: Johns Hopkins Press, 1960), p. 637.

If a marketing manager receives information indicating poor sales, he may decide to increase promotional expenditure in various ways which he expects will increase sales. Once information is received regarding the effect on sales, the promotional-expenditure decision will in some way be modified.

The essence of the feedback control system may be illustrated by the following block diagram. It involves measurement, (i.e. this is largely in the realm of market research studies) comparison, and corrective input. Johnson states:

Input is the activating element; the processor is the operating system; output represents the accomplishment of the system; the measurement channel is the senior element; the comparator - and - control channel is the control group element; and the objective, or standard, is the controlled item. Feedback control operates in a system expected to make errors, for the error is depended upon to bring about correction. The objective of such a system is to make the error as small as possible within practical limits.<sup>6</sup>

The block diagram highlights the importance of having a complete set of operating plans at all levels of the organization. These plans, as in the previous example, are the objectives or standards that influence the future inputs of the system.

Professor Forrester at M.I.T., starting from this feedback concept, has developed a series of models of

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<sup>6</sup>R. A. Johnson and others, The Theory and Management of Systems (New York: McGraw-Hill, 1963), p. 62.

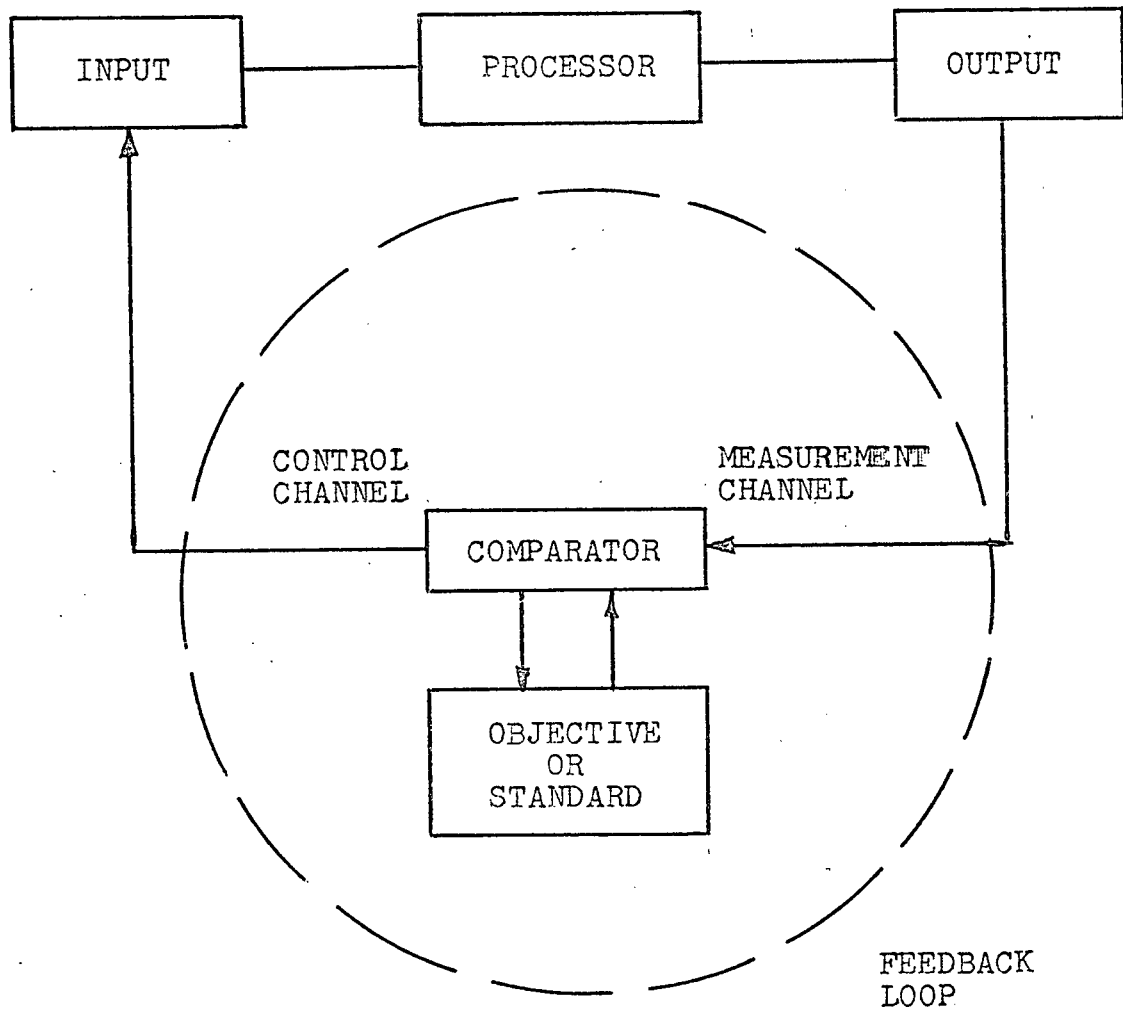


FIGURE 2.1

business systems which include factories, factory warehouses, wholesalers, retailers and consumers. The modern high-speed computer has made system simulation a practical tool and, by affecting parameters and variables in his models, he has been able to observe the effects upon his system.<sup>7</sup>

Forrester describes his general approach as follows:

Information feedback systems, whether they be mechanical, biological, or social, owe their behavior to three characteristics - structure, delay and amplification. The structure of a system tells how the parts are related to one another. Delays always exist in the availability of information, in making decisions based on information, and in taking action based upon the decision. Amplification usually exists throughout such systems, especially in the decision policies of our industrial and social systems.<sup>8</sup>

Although both this chapter and the "Industrial Dynamics" approach deal with information and its effects upon the whole business system, Forrester is primarily interested in inter-firm relations while the major problem under consideration here is intra-firm relationships, that is, with variables within the particular firm. Of course, the point of the studies such as "Industrial Dynamics" and other syntheses in terms of a feedback control-system theory is simply that one should have some method of analytically and systematically taking into account the effects of environmental factors on the individual, group or organizational

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<sup>7</sup>J. W. Forrester, "Industrial Dynamics, "Harvard Business Review, 36:72, July, 1958.

<sup>8</sup>Ibid., p. 15.

units making decisions. In this way, the reality we are trying to model or simulate is more closely approximated. The "Industrial Dynamics" studies are concerned with descriptive simulation of the organization system while simulation studies dealing with more specific and less complex aspects of business are aimed at providing normative models. That is, in situations where definition allows one to analyse the process in terms of an optimum, a theory is developed which predicts what the operation variables should be to achieve the predetermined optimum condition.

In summary, then, the factors impinging on decision making in an organization are represented by the various elements of theory. Decision making is a function of the structure of the information system and the associated economic theory connected with the physical processes controlled; it is a function of the organizational structure and the interactions of individuals who populate the firm as dealt with by the organization and behavioral theorists; finally, it is a function of the environmental factors or factors external to the firm.

## II. DECISION MAKING AND THE FIRM

### The Nature of the Decision Process

The elements of a decision. The decision process can be visualized in its simplest terms as originating at some point in an organization where an individual or group of



individuals is faced with a situation requiring a decision. Decisions, of course, are characterized by alternatives and, in recognizing that a given situation requires a decision, we are implicitly saying that more than one alternative exists. The next step is to analyse the data available in order to formulate various mutually exclusive alternative courses of action. Finally, in accordance with some specified or derived objective, that alternative which best accomplishes the objective, is selected and implemented.

Because the words "data" and information" are often used interchangeably, a distinction between the two should be drawn. The difference between the words is high-lighted by Gregory and Van Horn:

'Data' can be defined as any facts that are a matter of direct observation. As used in business data processing, 'data' means collections of signs or characters generally arranged in some orderly way to make up facts and figures. Numbers, words, charts, tables, and reports are examples of data which represent the syntactic level of an information system - the patterns formation of messages from words into a particular language . . . 'Information' is the significance derived from the data, which are vehicles for conveying certain potentially meaningful facts. The meaning of 'information' is at the semantic level - the relationship between a sign and the actual object or condition represented by the sign . . . 'Information' implies understandability, relevance, ability to act, novelty, timeliness, and accuracy.<sup>9</sup>

In a business firm, rarely does one find a pure data

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<sup>9</sup>R. H. Gregory and R. L. Van Horn, Automatic Data-Processing Systems, (Belmont, California : Wadsworth Pub. Co., 1960), p. 335.

or decision center but rather a combination of the two since one decision center generally transmits its decisions to others in the organization and, even in transmitting, the center makes decisions, i.e. the determination of what data to transmit, how to summarize data, how to present data. The specification of the decision premises are outlined in a decision rule, or, as it is more generally referred to, a policy. Policy is a formal statement giving the relationship between the information sources and resulting decision flows, the objective of the decision maker being to optimize the decision with respect to the policy specified. With reference to the previous block diagram, it represents a standard and as such is a basic element of the control function.

The range of executive decisions in relation to administrative structure. The able executive is characterized by his willingness and his ability to make decisions. Depending on the position of the executive in the organization, the decisions he will be called on to make will vary quite widely with structured and unstructured decisions at opposing poles defining a broad spectrum of decisions. The structured decisions are commonly problems which are repetitive and quantifiable and thus more amenable to solution. The more difficult, unstructured type of problem may be exemplified by those requiring setting of goals where no

precedents can be relied on. One is, therefore, looking at the segregation of decisions according to the extent to which the policies that guide decisions are known and agreed upon. At the lower end of the scale, decisions can be made on a fully automated basis by machines where the guiding policy is rigidly prescribed. In many large organizations now a vast bureaucracy of middle management is engaged in other decisions which cannot be mechanized since decision criteria have not been reduced to explicit, detailed, operating rules. Although the guiding policy is incomplete, it is well enough understood that a supervisor generally knows what to expect from subordinate decision makers. Still closer to the top of the organizational hierarchy, one finds decisions based on experience, judgment, and intuition in which, although the guiding policy does not appear in writing, there is a strong assumption as to what constitutes proper action. Finally, the top echelons of management are faced with making projections into a baffling future, beyond the frontier of traditional management actions. The variables involved may be unknown and so uncertain that a relatively unstructured frame of reference typical of human processes, as well as imagination, creative thinking, and intuition, represent the only methods of solution presently feasible.

The nature of these varying types of decisions should be considered in relation to the administrative

structure of the modern firm. Chandler and Redlich<sup>10</sup> have made a study of the historical evolution of decentralization that produced organizational structure similar to that employed today by such bulwarks of American industry as General Motors and Dupont. Previous to the late 1920's, the more progressive organizations were typically what they arbitrarily define as two-level structures. The company was organized in such a way that the major operating units consisted of functional departments. The cleavage between the upper and lower levels was at the position of functional head. The part of the organization from the functional head down, constituted the lower level while those positions above the functional head were thought of as the upper level. All major coordination of operations, goal determination and planning was done at the upper level.

However, continuous development of new products necessitated the basing of major-operating units on product lines which themselves were subsequently split along functional lines. In this new multi-product, multi-functional type of enterprise, the top level of organization was split up by delegation of one of its activities. The coordination of operations of various functional departments within

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<sup>10</sup>A. D. Chandler and F. Redlich, "Recent Developments in American Business Administration and their Conceptualization," Business History Review, 35:1-27, 1961.

the major lines of products was now handled by a new middle level of business administrators.

Within the bounds and limits of the policy established by the top team, chief officers of the product units made major decisions, although these decisions were quite distinct from those emanating from headquarters. Divisional performance was appraised by financial success (i.e. return on investment) and, to a lesser extent, by the share of the market. The coordination of functional units within the major lines of products demanded such special care that it became necessary to give full-time attention to administering the managers of these functional units. This task became the responsibility of a staff of specialists who were now the new middle level of business administration. Thereafter, the top team specialized in goal determination and planning, thus concentrating on their responsibility to the enterprise as a whole. The team's functions were appraisal, coordination and determination of policy both for the enterprise as a whole and for its multi-function, product-based operating units. In carrying out these duties, the general officers at central headquarters had the assistance of this staff of specialists.

This top team then communicated directly and interacted only with the men responsible for operations. Its decisions were concerned with balancing conflicting interests between the product heads whose demands were determined by

the products and functions for which they were responsible. In making those decisions, the top team had data and opinions presented by the functional staff specialists at headquarters who had little or no divisional connections or biases. The characteristic features of this new structure center on the separation of management operations and policy making as well as the insertion of a middle level with essentially administrative functions. Since the members of the top team were no longer responsible for operations and administration, they were psychologically more committed to seeing the concern as a whole and concentrating on goal determination; they had time for planning and, last but not least, they had excellent information assembled by the central staff.

By virtue of the delegated responsibilities, the perspectives, decisions and policies corresponding to each of the three levels in organization are quite different. This relates in part to the previous discussion to the degree to which decisions are structured in organization.<sup>11</sup> Considering executive perspectives, the product heads and functional heads below these managers, think largely in terms of a single product and related functional divisions. The middle management must take a broader view of the whole line of products offered by a firm as well as products

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<sup>11</sup>Supra, Chap. II, p. 21.

offered by others in the small industry. The top-management team considers the market as a whole and, depending on the size of the company, their horizons may be broadened from the small regional market to the national markets and even perhaps to the markets of the world.

Although Chandler and Redlich have addressed themselves in the main to industrial organizations, their observations with respect to the variation in the types of decisions made at different organizational levels apply equally well to retail organizations as well. This point can be noted in the next chapter when retail organization at the local level is reviewed.

The purposes of decision making. Disregarding for a moment policy decisions which will be considered later, the purposes of decisions may, for convenience, be broadly classified as strategic or tactical.<sup>12</sup> Strategic decisions are generally referred to as those that allocate the means of production (including available liquid funds and available manpower) according to the goals the enterprise expects to achieve. The course and life of the business entity in the face of all the uncertainties of the economy is largely plotted by such decisions. Tactical decisions, on the other hand, are decisions applying allocated means and manpower in the most efficient way possible. Though no precise dividing line exists between strategic decisions and tactical

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<sup>12</sup>A. D. Chandler and F. Redlich, op. cit., p. 24.

decisions, one can safely say that the decisions made by top management conform more closely to the strategic classification while middle management and operating management engage primarily in tactical decisions. The relative amount of time spent in planning as opposed to execution of plans therefore declines as one proceeds downward in organization.

One must remember that the arbitrary specification as a three-level organization is to contrast it with the historical two-level structure. In practice, a multi-level organization exists, extending right down to the lowest echelons. The perspective horizons and decision types naturally change from the top to the bottom of this management or supervisory structure.

#### Policy Formulation and Rational Behavior

Policy is the cornerstone of business itself since it is through policy decisions that the orientation of other decisions in the firm are determined. Policy is a reflection of organization goals and as such is fair game for decision theorists who have formalized a study of goal-orientated behavior under the title of the Theory of Value. A well documented paper by W. Edwards<sup>13</sup> and another by

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<sup>13</sup>W. Edwards, "The Theory of Decision Making," Some Theories of Organization (Homewood, Illinois : Irwin, 1960), p. 385.



N. M. Smith<sup>14</sup> delve into all the subtle theoretical considerations involved in setting goals and the operational problems encountered in optimizing decisions with respect to these goals. As in so many situations where concepts are investigated from a practical operational viewpoint, formidable problems present themselves in an attempt to bridge the empirical-conceptual gap.

We shall investigate the problems encountered by theorists who have attempted to devise some rational theory of the firm and individual, subsequently comparing this with some of the practical examples of corporate policy.

Micro-economics in the form of neo-classical theory by Alfred Marshal provides the theoretical basis for describing the resource distribution among firms in an industry, for explaining long and short-run industry development and explaining the evolution of a price structure in the industry.<sup>15</sup> Micro-economic theory supposes that the decisions of the firm are optimized by a "rational" individual-decision maker frequently referred to as the "economic man."

Economic man is modelled as a rational, omniscient, lightening-quick calculator who is confronted with a

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<sup>14</sup>N. W. Smith and others, "The Value and Science of Decisions," Some Theories of Organization (Homewood, Illinois : Irwin, 1960), p. 431.

<sup>15</sup>R. H. Leftwich, The Price System and Resource Allocation (New York : Holt, Rinehart and Winston, 1961), p. 169.

completely known set of certain or probablistic outcomes and is resolutely bent on maximizing a known objective, i.e. profit. The economist then defines the short and long-run equilibrium conditions for the firm in terms of price and rate output which are pursued by the entity as the embodiment of economic man. Though this may be a good model for ideal circumstances, it is not a good model for the individual decision maker with limited time at his disposal, limited perception and computing ability, and knowledge of only a few alternatives, all of which involve differing degrees of risk.

Either because of lack of interest on the part of economists or from lack of suitable analytic tools, there are many important questions the economic theory of the firm has left unanswered. To achieve satisfactory answers to questions as to how resources are allocated within firms, what the effects of organizational structure on management behavior are, and how price and output decisions are made in other than purely competitive situations, clearly it is necessary to reformulate our ideas of rational behavior to incorporate a greater degree of reality.

Studies in experimental psychology<sup>16</sup> have shown that men are not good calculators of dynamic behavior if

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<sup>16</sup>G. Miller, "The Magic Number Plus or Minus Two," Psychological Review, 63:81-97, Mar., 1956.

complicated systems and the number of variables they can properly relate to one another is limited. Long years of experience could lead to fairly good intuitive handling of situations in which the variables involved in the decision do not fluctuate appreciably. Naturally, individual capacity also is a factor. However, according to psychological research, intuitive judgment of a skilled investigator is often quite unreliable in anticipating the dynamic behavior of a simple information feedback system of five or six variables. Although one thinks he gives consideration to a larger number of variables, probably the variables are not properly related to one another in groups larger than five or six at a time. In view of these natural difficulties of the individual as a problem solver, it is appropriate to ask, even if it were possible to generate any number of reports and alternatives at little or no cost, how many alternatives should be submitted to the executive, how many differences can the consumer perceive between products, along with a myriad of other questions. On the strength of such evidence one has to concede such studies contain convincing arguments to refute objections that analytical techniques are unnecessary. The studies also give support to the modern trend toward exception reporting as the method of managerial control.

In conclusion, then, it is obvious, considering man's

limited mental capacity and psychological limitations, that economic man is more a myth than a reality. Much criticism has been directed against the capitalist as a ruthless profit maximizer, these critics perhaps taking for granted the economist's abstraction of economic behavior rather than investigating actual behavior. In any event, what would an economic man maximize--short-run profit, long-run profit, return on investment, net return to shareholders? The concept of profit desired is, therefore, difficult to define and, once defined, it is generally difficult to measure. As an alternative Simon<sup>17</sup> suggests that economic man be replaced by "sacrificing man" living in a complicated, vague, uncertain world, a man who does not attempt to maximize but is content if current levels of aspiration are met. This approach considers the underlying factors of incomplete information, conflict amongst goals, limited perceptions and desires, combined with the ability to learn and to modify his desires. Although speculation on such a "sacrificing man" may bring out some interesting aspects of human behavior, unfortunately such a situation is difficult to deal with as it is not well defined analytically.

The basis of the issue is whether the rational integration of numerous policies, such as those listed by

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<sup>17</sup>H. A. Simon, Models of Man (New York, Wiley, 1959).

MacPhee<sup>18</sup> is and/or can be accomplished in accordance with some definitive and defensible criteria of optimal company operation. In answer to this, the previous discussion indicates that, in view of all the practical limitations involved such an optimization as represented by "sacrificing man" is not yet possible.

#### Company Policy in Practice

In practice, the preceding difficulties in defining corporate objectives are borne out as reflected in the multiplicity of vaguely defined goals apparently followed by various businesses. Shublik<sup>19</sup> made a survey of top-management policy which reveals that for the twenty-five corporations included, the policies represent a blend of political, social, economic and ethical considerations which provide an image of business considerably different than that of economic man.

By frequency of occurrence, these policies were:

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<sup>18</sup>E. D. MacPhee, Lecture Notes - Policy and Administration (Vancouver, B.C. : Best Printer Co. Ltd.).

<sup>19</sup>M. Shublik, "Approaches to the Study of Decision-making Relevant to the Firm," Journal of Business, 34:102-118, April, 1961.

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personnel	21	corporate growth	8
duties and responsibilities to society in general	19	managerial efficiency	7
consumer	19	duties to government	4
stockholder	16	distributor relations	4
product quality	11	prestige	2
technological progress	9	religion as an explicit guide	1
supplier relations	9	PROFIT	13

Given a set of such vague goals, how is top management to optimize company operation with intangible guides? Such situations are in the realm of unstructured strategic decisions and the new organization theorists add little to clarify the situation. This is definitely a situation where intuitive process and long experience in business are still the best bases for making decisions. In some levels of middle management one finds examples of decisions that previously were considered to be so subtle that no reasonable approximation could be made to them through formal decision rules. Increasingly, however, there is ample evidence that they should be looked upon more critically as difficult decisions which, once analysed and logically structured, can be dealt with more easily. As mentioned previously, often the limitations involved in such decisions stem from the limited mental capacity of the

individual to understand the behavior of complex systems. The new approach to problems in this area will be the focus of interest for the remainder of the chapter.

### III. THEORETICAL DECISION-MAKING TOOLS

#### The Role of Management Science

The interest in the study of organizations and organizational behavior in the past few decades has become a focal point for interdisciplinary research. Emphasis has been placed on the study of organization as a scientific field and, because this field is relatively new, there is no well-defined community of scholars who are leaders in the field of organization theory. Scholars and researchers working in such diverse fields as mathematics, sociology, social psychology, engineering and economics have made direct and indirect contributions to business theory. Inevitably, as the gap between these more specialized theories and more general traditional concepts of management widened, there was an obvious need to coordinate and compromise new ideas with the old. The task of relating the tools of analysis, developed by other disciplines, to the art of management was taken on by the so-called management scientists.

Management science views the organization as an integrated decision system similar to that presented earlier in this chapter. The framework of management

science, as for any science, is the scientific method although certain fundamentals implied by the scientific method are of more importance for our purposes than the specific steps involved. The term "scientific method" suggests a relatively formal, systematic, thorough approach to problem solving which, in turn, implies logical solutions based on facts, objectivity and creativity. The method is characteristic of a mind which is constantly challenging, weighing and explaining; it is characteristic of an approach which recognizes that often definitive answers to problems are not possible, the solution then being the selection of the best amongst a spectrum of possibilities.

Scientific management, as a subdivision of management science, was founded by Frederick Taylor. Taylor wanted to show that the "principles" of scientific management were applicable to all kinds of human activity. Despite his emphasis on the need to discover generalized rules, Taylor himself stressed that each situation must be analysed separately and that findings in any specific study were only narrowly applicable. He was convinced that the greatest problem involved in the change to scientific management was the need for a complete revaluation in the mental attitudes and habits of all those engaged in management. The whole field of industrial engineering stemmed from the early scientific management movement. Gradually,



as problems became more complex, additional tools and techniques developed tending toward a more mathematical approach to problems. These new specialized techniques became identified with the name "operations research."

From the standpoint of methodology, there is nothing that differentiates operations research from many other types of business or economic analysis. The method involved is still the scientific method, i.e. the analyst must examine a problem, pick out the dominant variables, hypothesize relationships between these chosen variables, and finally test his model in the real world. The acid test is the ability to make improved forecasts of future behavior. In fact, whereas operations research in its early days was distinguished by using an interdisciplinary team approach, in many cases the research team now includes industrial engineers. Although there is not a clear-cut line of demarcation between operations research and other applications of the scientific method to management decision making, the use of mathematical models to represent the system under study is stressed somewhat more in its definitions.

Concepts of models and systems are important to the operations research approach. However, the current popularity of the terms "model" and "system" in business literature tends to obscure the fact that many business administrators have intuitively always thought in terms of

models. The next chapter on department-store organization, for example, will repeatedly use a very common analogue model to help simplify the discussion about organization. This model is commonly known as the organization chart. The basic idea of a model therefore is not new. What is new is the increased sophistication of the model which is the result of theoretical studies into the nature of models. The operations research approach is to use the model and systems concept explicitly, ensuring that an analysis is done on all relevant variables and striving to establish some sort of structural relationship between variables. However, the Industrial Dynamics philosophy claims that there is a general misunderstanding to the effect that a mathematical model cannot be undertaken until every constant and functional relationship is known to a high degree of accuracy.<sup>20</sup> This often leads to the omission of admittedly highly significant factors (most of the "intangible influences on decisions") because they are unmeasured or unmeasurable. As mentioned, psychological evidence supports the validity of the use of a model as a tool for extending the executive's judgment in large-scale complex system.

In a sense, the use of a model frees the intuition and permits it to concentrate on those problems to which it is particularly suited. It permits the

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<sup>20</sup>J. W. Forrester, "Industrial Dynamics," Harvard Business Review, 36:76, July-August, 1958.

creative manager to test rigorously the implications of new plans, new schemes and new ideas.<sup>21</sup>

Introductory reference was made to the system concept; however, it must be stressed that one is involved with a frame of mind which can serve to orient the application of specific techniques. Simon, commenting on this writes:

Along with some mathematical tools, . . . operations research brought into management-decision making a point of view called the systems approach. The systems approach is no easier to define than operations research for it is a set of attitudes and a frame of mind rather than a definite and explicit theory. At its vaguest, it means looking at the whole problem - again hardly a novel idea, and not always a very helpful one. Somewhat more concretely, it means designing the components of a system and making individual decisions within it in light of the implication of these decisions for the system as a whole.<sup>22</sup>

Construction of a model is a common technique for studying the characteristics of systems under varying conditions. The model is an abstraction of the essential elements that characterize the system, or the previously unstructured situation which one wishes to view as a system. It is used to test the impact on the entity, resulting from changes of one or more model components without having to actually disrupt operation of the system studied. Although

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<sup>21</sup>F. A. Lindsey, New Techniques for Management-Decision Making, (New York : McGraw-Hill, 1958), p. 14.

<sup>22</sup>H. A. Simon, The New Science of Management Decision (New York : Harper, 1960), p. 15.

other than mathematical models are possible<sup>23</sup> this is the type of model used in operations research. Such models have an obvious advantage in that they allow the isolation of experimentation from the actual physical process. On the other hand, they may be time-consuming and costly to construct while, at the same time serving possibly only as a very imperfect abstraction of reality.

It should be noted that industrial problems do not fall into neat categories, so that often combinations of several techniques have proved worthwhile in managerial decision making over a period of years. Other techniques have not been usefully applied in real situations as yet. Still others fall between these extremes, having limited applications in practical situations. The following discussion of the techniques will, of necessity, be general, but references are provided as a guide to more complete source material.

#### Some Theoretical Problem Solving Tools

Mathematical programming models. Econometrics and mathematical programming models (i.e. linear programming, quadratic programming, dynamic programming) are related in that some of the first uses of these techniques were in the field of economics. The econometrician typically studies some economic process with the intention of determining the

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<sup>23</sup>R. L. Ackoff, Scientific Method: Optimizing Applied Research Decisions (New York : Wiley, 1962), p. 109.

various input parameters, their relationship to each other and to the output of the process, and the restrictions placed on the input and output factors. To the economist this is a well-known economic allocation problem. The technique of programming determines how to use these limited resources or capacities of a business to obtain a particular objective, such as least cost, highest margin or least time, in such situations where the problem is well defined and the resources have alternative uses.

It is a technique that systematizes for certain conditions the process of selecting the most desirable course of action from the number of available courses of action, thereby giving management information for making a more effective decision about resources under its control.<sup>24</sup>

The problem of selecting an optimum decision with respect to some specified objective function therefore, is one of selecting the right combination from possibly thousands of combinations which conceivably could present themselves.

Because linear programming treats all relationships as linear, it has an inherent limitation, in general, a non-linear type of relationship is to be expected. However, because many problems lend themselves to linear approximation, the linear programming technique can be extremely useful.

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<sup>24</sup>R. A. Ferguson and L. F. Sargent, Linear Programming, (New York : McGraw-Hill, 1958), p. 3.

Quadratic and dynamic programming, algebraic techniques similar to linear programming, have been developed to offset some of the disadvantages inherent in linear programming. Quadratic programming permits the use of non-linear relationships and thereby allows one to develop more realistic models.<sup>25</sup> Dynamic programming deals with situations where, at each period, a decision maker chooses an action which influences a sequence of events stretching off into the indefinite future.<sup>26</sup> In subsequent periods one can modify the effects of previous decision by current action whereby the rules of decision are generated as a dynamic program. This is a more realistic approximation of an actual decision process, similar to that used for over-all long-range strategic decisions. Bellman states that some of the problems which may be solvable include: long-range capital budgeting, timing of equipment replacement, machine-loading in job shops, transportation scheduling to meet shifting demands and smoothing of production levels to meet available demands.<sup>27</sup> However, the mathematics of the functional equations is quite difficult and, as yet, relatively undeveloped, the result being that only particular types of problems can now be solved.

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<sup>25</sup>A. Vazsonyi, Scientific Programming in Business and Industry (New York : Wiley, 1958), p. 198.

<sup>26</sup>Ibid., p. 219.

<sup>27</sup>R. Bellman, Dynamic Programming, (Princeton, N.J. : Princeton University Press, 1957), p. 7.

Problem solving under uncertainty. When decisions are made involving future courses of action, inevitably the manager is forced to deal with problems of uncertainty or probability. Statistics and the theory of probability have long been applied to sampling problems in business. Extrapolations of results obtained through statistical sampling, however, are only valid where it can be reasonably assumed that the process sampled is a stable one. When such is not the case, Baye's theorem has been found useful in revising probabilities in the light of additional information. In statistics, Baye's theorem determines how to combine an existing probability distribution with further information in the form of a conditional probability distribution which is gained by sample evidence. The resulting revised or posterior distribution summarizes the improved state of knowledge of the individual. This so-called Bayesian approach to statistical decision theory which parallels the trial and error behavior of the rational individual, has been the particular interest of Robert Schlaifer who has written several books on business decision theory dealing fully with the subject.<sup>28</sup>

Game theory should be mentioned here even though applications have been few in number and limited in

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<sup>28</sup>R. Schlaifer, Probability and Statistics for Business Decisions (New York : McGraw-Hill, 1959); R. Schlaifer, Introduction to Statistics for Business Decisions (New York : McGraw-Hill, 1961).

scope.<sup>29</sup> This theory originally formulated by Von Neumann and Morgenstern involved analysis of the choice of strategies in competitive situations. Even though game theory is still primarily a field of pure theory, the technique can provide insights for managers contemplating competitive situations, in that the formal thinking process forces consideration of both their own, as well as their competitors' strategy. Attempts to construct adequate theories of many-person games highlighted difficulties such as the meaning and role of information in situations of conflict. The simple theories that were constructed by Von Neumann and Morgenstern at any rate have provided a language for the study of decision making.

Queuing theory or waiting-line theory, was developed in order to provide a model to predict the behavior of a system that is designed to provide services for randomly-arising demands.<sup>30</sup> Unlike theories such as linear programming which attempts to optimize resource allocation, queuing theory is mostly a descriptive mathematical theory. Using data that is characteristic of the service facility system (i.e. arrival rates, queue discipline, service rate, number of service facilities), the theory's purpose is to aid in the understanding of queues, thereby allowing

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<sup>29</sup>M. Sasieni and others, Operations Research: Methods and Problems (New York : Wiley, 1959), p. 155; A. Vazsonyi, op. cit., p. 255.

<sup>30</sup>Ibid., p. 125.



remedies to be introduced once the fundamentals are understood. Many variations are possible simply by changing the arrival-time distribution, service time, distribution, queue discipline, and the number of service facilities.

Simulation. Two general types of simulations have been developed. In one case, the decision-making process is programmed into the simulation in order that the entire system may be run automatically without involvement of human-decision makers. A second type requires recurrent decisions on the part of outside decision makers, the results of those decisions being generated by a simulated system which ordinarily is programmed for an electronic computer. The former is called system simulation and the latter has been described as competitive simulation or gaming.

Business gaming attempts to duplicate a situation in the real world in which managers must not only contend with a complex environment but must also make decisions in competition with other managers seeking the same or similar goals. The gaming model is a simulation of an entire industry, consisting, in the more advanced games, of a large number of formulae which determine the results of each move by the various teams of decision makers taking part in the game. A number of basic equations must be programmed which depict the total industry performance based partly on external environmental influences and

partly on the combined actions of the "companies" in the industry. The other set of equations programmed into the gaming simulation relates to a performance of a particular company in the industry environment. The results of the game are given quantitatively in terms of such factors as market share, dollar sales, per cent profit or return on investment.

This gaming-type simulation is one where the entire industry is involved. It has been used primarily as a training device as it is often claimed to be useful in teaching an appreciation of the interrelationship between the functional areas in an organization. Other simulations have been developed which deal with only one part of the business enterprise, i.e. distribution, finance, sales management, etc. While gaming or competitive simulation is an interesting and worthwhile exercise, because of the interactions of strategy the multiple team game is so complex and the cause and effect situations so obscured that systematic analysis of results is extremely difficult.

The other broad field within simulation, symbolic-system simulation, appears to be a powerful tool for both training and research.<sup>31</sup> System simulation has many advantages. It enables one to compress or expand real

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<sup>31</sup>W. E. Alberts, System Simulation, (Seventh National Conference of the American Institute of Industrial Engineers, 1956).

time, that is, the businessman can simulate a year of operation in a matter of minutes by using a computer, or he can slow down the process so he can analyse just what is going on in his problem areas. Related to this is the advantage of being able to test ideas and changes in advance. Perhaps more fundamental, in designing the model the sheer amount of discipline required to produce flow diagrams and check for consistency in models, is of value in obtaining a better understanding and improved control of complex business operations.

The application of system simulation is not undertaken with the idea of optimizing the total system or even a segment of it. In any reasonably large system or subsystem, conditions such as interdependence, immeasurability, incompleteness, ineffectiveness of practical working rules, and imperfect coordination make it impossible to derive and set forth an organization and set of decisive rules which will optimize the operation of the system. Simulation of a complex business enterprise allows one to analyse the dynamic behavior of a system as it exists and also allows for testing new and different organizational arrangements and policies. The work done by Forrester at M.I.T., cited earlier in this chapter, is an example of one of the more comprehensive approaches to system simulation. More specialized simulation studies are being carried out by such firms as Rand Corporation, United Air

Lines, Arthur D. Little, I.B.M., and General Electric, amongst others.

Another application of the general approach of system simulation can be found in network analysis. Network analysis is a managerial technique used to recognize and identify all the interconnecting links in a single system or series or network of systems. Critical-path scheduling is an example of network analysis which has been used in construction or engineering projects. In fact, it has broad application and can be used in almost any situation involving scheduling which imposes exacting requirements of time and performance. Line diagrams play a key role in showing all vital activities, thus clarifying the relationship of every task to every other task. They also show which jobs on a project are critical, the ones which can effect the completion of the project.

Only the jobs, from start to finish of a project, that relate to one another, each depending upon the completion of the other one before it, can be critical jobs. It is the sum of the time the critical job will take that will be the total project time. It is the path the lines representing these jobs take through the project diagram that is the critical path from start to finish of the project. Thus the name: Critical Path Method.<sup>32</sup>

PERT is another similar technique used in planning which was first publicized when it succeeded in shortening

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<sup>32</sup>"New Tool for Management," Engineering News-Record, Jan. 26, 1962, p. 26.

considerably the development time of the Polaris Missile Program in the United States.<sup>33</sup>

The computer. A development that must be mentioned in connection with the growth of management science is the introduction of the electronic digital computer. Although the computer adds nothing directly to the body of theoretical knowledge, it is an invaluable tool for solving complex problems as well as performing the more commonplace data-processing problems of business.

The modern electronic digital computer had its beginnings in the concepts developed by that versatile genius Dr. John Von Neumann. The stored program, central arithmetic, and control-unit concepts he used in the design of that first computer, without which the Second World War atomic bomb Manhattan Project in the United States would never have been completed when it was, formed the basis for the so-called first generation computers. Sprague<sup>34</sup> has traced the evolution of the computer through its first generation to present third-generation stages, mentioning the transition technically from vacuum tube to solid-state electronic circuits; the development of design concepts from the serial-fashion operation of all

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<sup>33</sup>R. W. Miller, "How to Plan and Control with PERT," Harvard Business Review, 40:98, March, 1962.

<sup>34</sup>R. E. Sprague, Electronic Business Systems, (New York : Ronald Press, 1962), p. 34.

computer actions governed by a single control unit to the overlapping operations made possible by the multi-control unit, master-slave relationships now used in design; and, finally, the adaptation of the computer from a scientifically oriented machine with slow input-output operations to a machine having the essential peripheral equipment and the high speed input-output needed by business today.

Our predominant interest in the computer in this thesis is its usefulness in data processing of a more accounting oriented nature. With reference to Figure 2.1,<sup>35</sup> the computer serves as a tool in the measurement channel to more quickly and efficiently monitor the paper flow generated as a by-product of the physical business operation. The computer, in doing this data-processing task, thereby facilitates the control process and provides a valuable service to management. However, it is important to see the computer in a broader business setting which may very well form the foundations for the management of tomorrow. Retailing, for example, is just beginning to be introduced to inventory models based on the well-known economic order quantity-mathematical models developed early in this century by industrial engineers. This inventory system is variously known in the trade under such names as SIM (i.e. simulated inventory management) which was developed by a firm of management consultants and

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<sup>35</sup>Supra, Chapt. II, p. 17.

IMPACT, developed by I.B.M. This is just one indication of future developments.

### An Overview of New Management Methods

The hard-headed businessman often looks at management science techniques as so much academic trivia, a typical example of what is produced by those living in an academic vacuum, divorced from the reality of the business world. Surely the main task must be to strike some sort of balance between theory and reality. Business studies have long been largely descriptive with little attempt to conceptualize the underlying processes or to try to blend abstract theory and reality to produce some sort of normative description of business behavior.

Until the goals of business enterprise are well defined with some reasonable means of estimating the attainment of goals, business must depend on a trial and error navigation system. Goals in themselves are not stationary but a product of time and the society in which we live. Relating the vaguely defined goals to company operations inevitably involves value judgments on the part of the decision maker. The use of management science techniques is not invalidated by these problems because management often seeks selected objectives, despite the inability to integrate all subsidiary policies into a broad over-all master plan. Mathematical programming,

for example, might achieve the cost minimization desired but perhaps otherwise not practically attainable.

One might question whether the discontinuity that exists between the structured and unstructured decision spectrum in the firm is the result of the impossibility of forcing a basic unstructured situation into a structured mould, or, if on the other hand, at some later age of sophistication, techniques will be available to accomplish what we presently cannot do. However, it is an obvious fallacy to believe that all business phenomenon will eventually be explained by such mechanistic theory. Kaplan, a philosophy professor at the University of California, has written a brief but quite knowledgeable resume of the application of various branches of mathematics to problems of the social sciences that pinpoints limitations of mathematical and scientific methods in explaining social behavior.<sup>36</sup>

These new developments of business presented certainly cannot be looked upon in isolation. Because the theory has drawn on other disciplines, it can be seen that it is part of a trend to recognize the inter-relationships of parts and to view the various academic structures as a dynamic whole. In our drive to achieve this integration of various perspectives, it is well to consider a sobering comment by Koontz who, in discussing

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<sup>36</sup>A. Kaplan, "Sociology Learns the Language of Mathematics," Some Theories of Organization, (Homewood, Illinois : Irwin, 1960), pp. 29-46.



various approaches to the study of management, states:

From the orderly analysis of management at the shop-room level by Frederick Taylor and the reflective distillation of experience from the general management point of view by Henri Fayol, we now see these and other early beginnings over-grown and entangled by a jungle of approaches and approachers to management theory.

There are the behaviorists, born of the Hawthorne experiments and the awakened interest in human relations during the 1930's and 1940's, who see management as a complex of interpersonal relationships and the basis of management theory the tentative tenets of the new and undeveloped science of psychology. There are also those who see management theory as simply a manifestation of the institutional and cultural aspects of sociology. Still others, observing that the central core of management is decision-making, branch in all directions from this core to encompass everything in organization life. Then there are mathematicians who think of management primarily as an exercise in logical relationships expressed in symbols and the omnipresent and ever-revered model. But the entanglement of growth reaches its ultimate when the study of management is regarded as a study of one of a number of systems and subsystems, with an understandable tendency for the researcher to be dissatisfied until he has encompassed the entire physical and cultural universe as a management system.<sup>37</sup>

Certainly the new theories have all the characteristics of an advance in knowledge because, before one can synthesize, discussion and the challenging of old ideas are necessary. Eventually, order may come out of chaos. At any rate, some expansion of knowledge is bound to result. The analogy between the present stage of knowledge and an iceberg is appropriate since only a small portion of the solution is as yet visible.

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<sup>37</sup>H. Koontz, "The Management Theory Jungle," Journal of the Academy of Management, 37:174-175, Dec., 1961.

Rapid advances in technology, communications, and studies of the social sciences in the last few decades are evidence of the increasing tempo of business. Business must regard newer developments in automation and decision making critically and, rather than fearing the developments, try to understand and use them to their best advantage. This does not mean that the manager has to become a competent scientist--philosopher--mathematician--psychologist all rolled into one. However, it is increasingly evident that business must face up to the critical problem of developing more quickly the executive's ability to make effective decisions. It is important that the modern manager assimilate the various viewpoints into his total perspective. Herein lies the best argument in favor of the system's approach that Koontz so critically commented on.

In the final analysis, one must keep in mind that the executive is primarily an administrator rather than a technician. Management science and the particular techniques presented are concerned primarily with the means and methods of decision making, rather than the formulation of basic premises and criteria for determining the ends. Its limitations must be recognized by the decision maker and it must also be recognized that objectives and values inherent in decision making are still left to the individual. It cannot help in defining what the problem

is, cannot set the objectives of the solution, cannot set the rules by which the relationships are governed, cannot make decisions concerning the best solution and cannot by itself make decisions effective. Therefore, although the techniques are of great importance in analysing the problem and developing alternatives, there are vital phases of management-decision making that it cannot replace. Used intelligently by management it is extremely useful, but unless used properly, it could be a potent means of making wrong decisions. If the new techniques provide an avenue toward better decision making in technical areas, the business administrator is left with more time at his disposal to grapple with the more complex intangible problems of business.

## CHAPTER III

### DEPARTMENT STORE ORGANIZATION

#### I. THE VALUE AND LIMITATIONS OF ORGANIZATION CHARTS

An essential prerequisite to the study of merchandising procedure and problems of retail department stores is an understanding of current organization structures. Because the organizations studied in Vancouver are all members of national department-store chains, a complete description of the organization would include the structure of the home office, as well as unit and branch stores. However, due to the focus of this thesis on merchandise planning and control, the responsibility for which is largely vested in local management hands, it is thought that detailed description of organization other than at the local regional level, is not particularly relevant to the problem being considered. On occasion, reference may be made to the entire organization structure when questions of centralized policies and controls must be considered in relation to local operating problems. Because organization charts are, of necessity, flexible and variable from department store to department store, detail is not considered to be of great importance except

perhaps in the discussion of the merchandising division.

It would perhaps be useful to remember that the concept of an organization chart is of limited use and its limitations should be kept in mind throughout this discussion. The organization chart is a model representing the formal relationships which are believed to exist or which are planned between the people involved in the group for which the chart is drawn. The chart is a greatly simplified mapping of relationships because obviously any attempt to show all formal and informal connections would result in an end product of little use. As well, the chart is intended to be a representation of an organization at one particular point in time, whereas, in actual practice, organizations tend to evolve according to the store needs, availability of personnel, existing business conditions, etc. The chart, then, may or may not represent the organization structure as it actually exists. It is, at best, a guide by which one may orient their thinking regarding the relationships between authority and responsibility vested in different people in the organization.

Organization is the structure through which management operates to accomplish the fundamental object of retailing, namely buying and selling to perform a profitable and necessary public service. There are many facets to the performance of this objective in the large

department store and, in the interests of operating efficiency, it has over the years been found necessary to provide for specialization of duties. This specialization involves organizing the store personnel into groups according to function, with these groups being placed under the leadership of executives who are specialists in those functions. Good store organization results in coordination of these specialized groups and organization chart is a means of expressing and simplifying these functional relationships.

## II. THE FUNCTIONAL CLASSIFICATION OF STORE ACTIVITY

Delineating the functions around which retail stores are organized is to some extent arbitrary with the resulting classification depending upon one's point of view. For the purpose of this thesis, one may classify the major functions of a department store under the headings of buying, selling, general administration, and operating-occupancy.

The buying function includes activities connected with purchase planning, stock control, actual buying, as well as other minor activities which aid buying performance. Under the selling function are sales planning and promotion; television, radio and newspaper advertising, personal selling, window and floor displays. The

operating-occupancy function provides for maintenance of the physical plant and equipment; receiving, marking and delivery of merchandise; adjustment of customer complaints; purchase and control of store supplies; store and customer protection; training of store operating personnel.

General administration includes the determination of general policies and budgets; staffing and organization, directing, controlling, and coordinating of all store activities. Some of the functions will be dealt with in greater detail at a later point.

One could safely say that these functions are essentially the same in all stores regardless of size or type. There is, however, considerable variation in details of organization structure due to the varying needs faced by different department stores. Structurally in organization, the above listed functions are commonly carried out under divisional classifications of merchandising, publicity, finance-controller, operating and personnel. In some organizations, all five classifications represent different divisions in organization and are on occasion, even subdivided further. In other organizations classifications are combined into fewer number of divisions.

### III. THE FOUR-FUNCTIONAL MAZUR PLAN

#### Introduction

In any discussion of department store organization

a historical point of reference has always been a study done by Paul M. Mazur in the 1920's, in conjunction with a committee on retail organization appointed by the National Retail Dry Goods Association (NRDGA) in 1924.<sup>1</sup> This association, now known as the National Retail Merchants Association (NRMA), is a body which has provided impetus for initiating many studies that have greatly contributed to retail store operation. The report submitted by Mazur to the NRDGA, including the well-known Mazur Plan or organization, has exerted an important influence upon organizational policies and practices of retail stores.

The four-functional plan proposed by Mazur set up divisional managers in charge of control, publicity, merchandising and store management. The simplified plan is presented in Figure 3.1, without including such common staff functions as research, comparison shopping, planning, etc., which are arranged differently by different management. In this, as well as succeeding organization charts, there is a standardization of terminology to facilitate the general comparison of different structures studied locally. It should be borne in mind, however, that administrative positions in different department stores, though similar in title, are obviously unique in

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<sup>1</sup>P. M. Mazur, Principles of Organization Applied to Modern Retailing (New York : Harper, 1927).



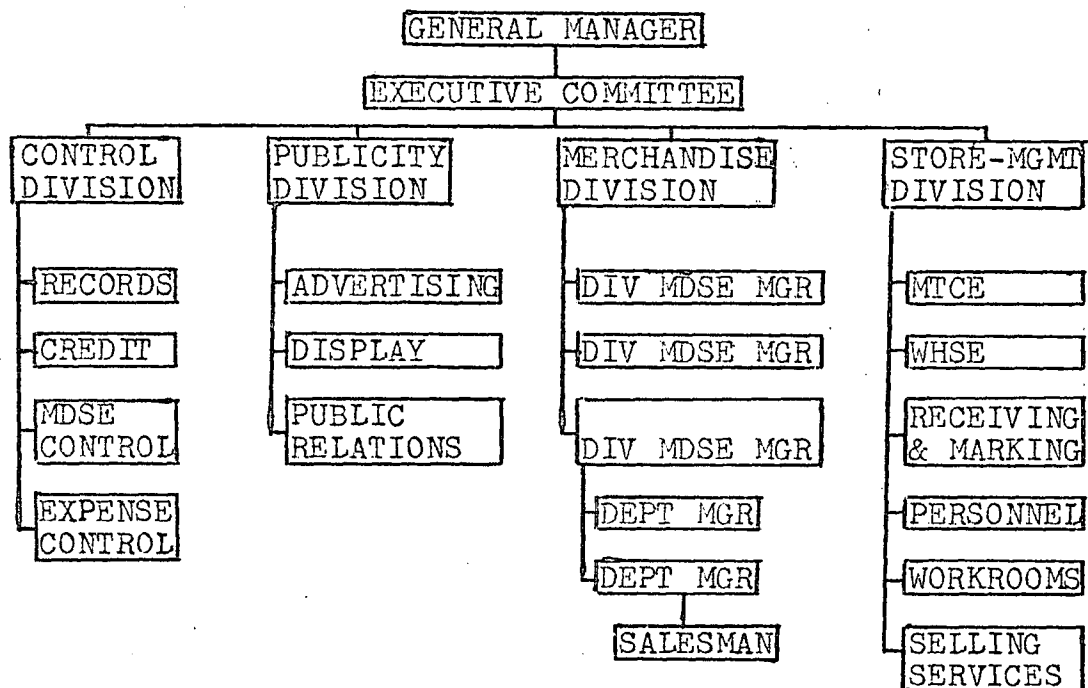


FIGURE 3.1

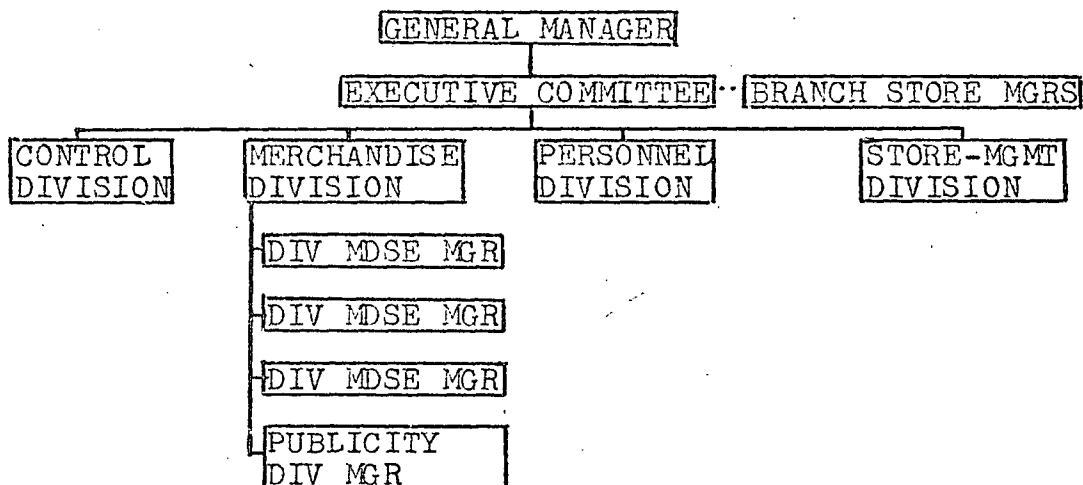


FIGURE 3.2

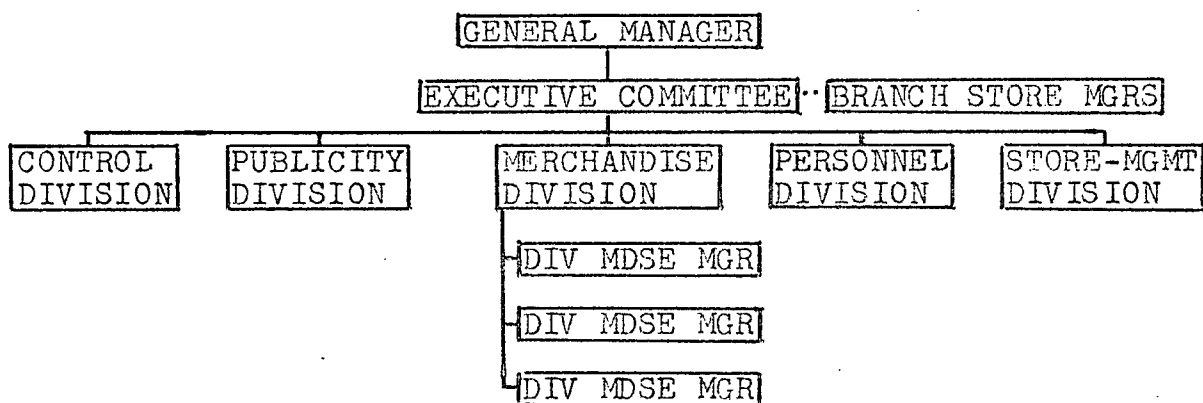


FIGURE 3.3

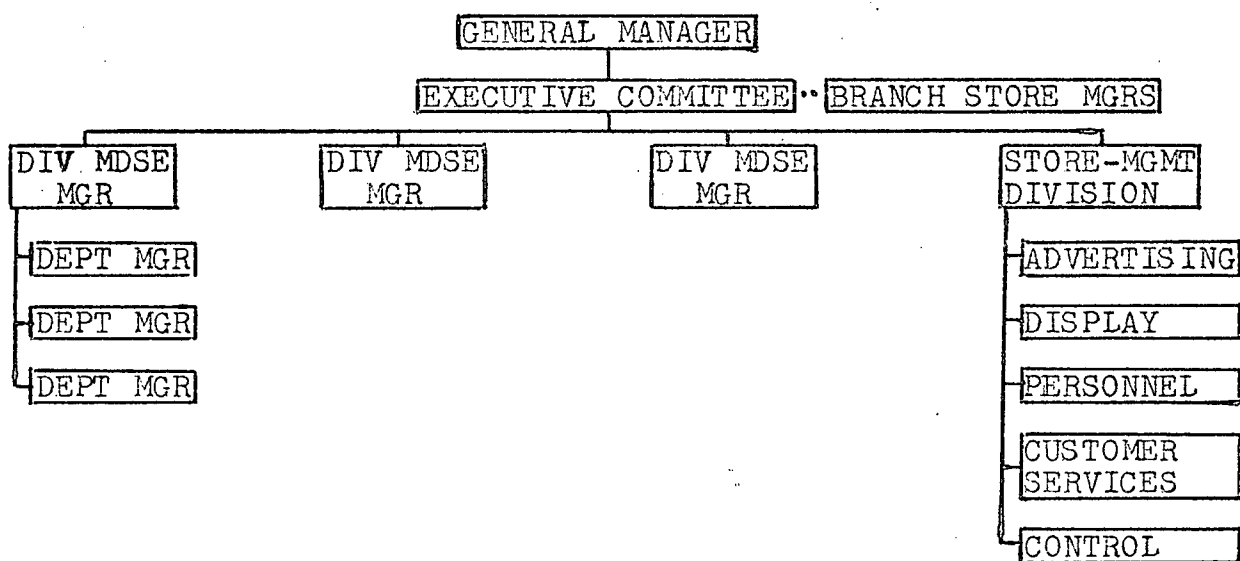


FIGURE 3.4

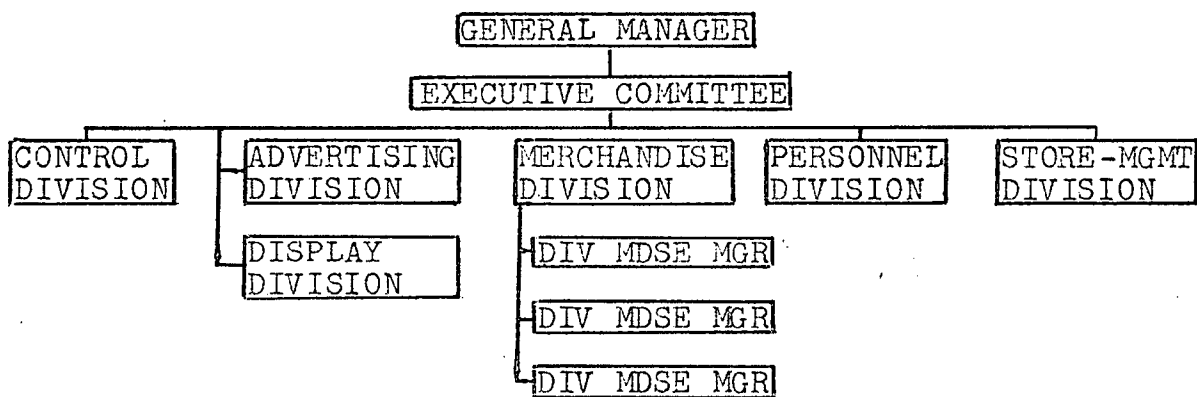


FIGURE 3.5

that responsibilities and relative authority are never exactly the same. Ultimately, these will depend on the qualifications and ability of the man filling the position.

The general manager is the top executive position in the unit department store operation and his responsibilities are, very broadly, to coordinate, direct, and control the various divisions, in order that a cooperative effort is made to achieve the growth and profit goals set for the store. More specifically, the general manager must authorize the final form of the merchandise and expense budgets for the store; select or recommend to his superiors the individuals who are deserving of the major executive positions; represent the store to the public and business groups; provide for the extension and revision of store organization in response to changing needs.<sup>2</sup> Of course, an overriding role of the general manager, similar to any major executive, is a policy-making role in which he must decide on questions affecting the store in general. In many stores an executive committee consisting of the general manager and the divisional heads is the group through which a meeting of the minds to decide policy questions takes place.

### Merchandise Division

The merchandising division in the Mazur Plan, headed

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<sup>2</sup>W. R. Davidson and P. L. Brown, Retail Management (New York : Ronald Press, 1960), p. 169.

by the general merchandising division manager, is responsible quite simply for directing the majority of merchandising activities. Merchandising is an all-inclusive term which refers to the function of adjusting merchandise stocks offered for sale to customer demand through the buying, selling, planning and control of stocks. Because merchandising is the essence of department store operation, it is not surprising that the merchandise division manager is often considered the most important divisional executive. The general merchandising manager's role is largely a supervisory one. The store merchandise budget is formulated through consultation between the department managers, division managers, and the general merchandise manager. Once the merchandise budget is drawn up and approved by top management, the general merchandise manager assists and directs his subordinates to ensure that the planned objectives are achieved. Due to the large number of product lines, departments, and personnel which come directly under the general merchandise manager, the merchandise budget is a device of some considerable importance in the eyes of the merchandise manager. Understandably, considering these circumstances, he relies heavily on statistical control and exception reporting to maintain control over merchandising operations.

Because of the varying problems inherent in carrying the large selection of merchandise offered by the large

retail store, the establishment of individually operated departments has become a virtual necessity. The grouping of stocks which present relatively similar merchandising problems into a department or departments is an outstanding characteristic of the department store, the one from which it derives its name. Each department or group of related departments is managed by a department manager or buyer who usually is directly responsible for the success or failure of the merchandising operations. This success is quantitatively evaluated by management in terms of some profit measure, depending on the extent to which the department manager is held responsible for expenses. The responsibility for the buying and selling function of each department is, therefore, delegated to the department manager. In accounting terminology, each department is made a profit center and the manager of the department is, in a sense, in business for himself.

The buyer, in consultation with the general merchandise manager or division merchandise manager, works out a merchandising plan or campaign for his department. This includes setting sales goals, determining the levels of stocks he will carry, determining when he will order his merchandise, as well as deciding on quantities, size distributions, colors, styles, etc. The buyer is faced with decisions which can only be effectively answered by someone such as himself who, through continual contact

with these problems, has become intimately familiar with the marketing situation. As part of his selling responsibility, the buyer often directs the training of sales people assigned to him, plans sales promotional events and makes suggestions to the publicity divisions, especially with regard to merchandise features which should be promoted. The position of buyer or department manager is one which typically requires a person of imagination, drive and a sense of personal responsibility.<sup>3</sup> Because of the nature of the department store merchandising situation, the success or failure of store operations depends to a large extent on the quality of department managers, due to the considerable responsibility vested in them by management.

In most department stores of any appreciable size, and, incidentally, this was true for all those included in this study, divisional merchandise managers provide coordinating links between the general merchandise manager and the department managers. The department stores studied all had in the neighborhood of thirty to forty department managers in their main stores administering approximately one hundred departments. Some department managers are in charge of six or seven departments. Obviously, the general merchandise manager cannot effectively administer such a

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<sup>3</sup>J. W. Wingate and E. O. Schaller, Techniques of Retail Merchandising (Englewood Cliffs, N.J. : Prentice-Hall, 1956), p. 8.

large number of department heads and hence the need for divisional managers.

Each division manager is in charge of the merchandising operation of what should be, if possible, a related group of selling departments and he supervises the work of the buyers for these departments. In practice, division managers sometimes have under their control a heterogeneous grouping of departments which may not bear any significant relationship to each other. The divisional manager's position is one of reconciling the plans and operations of buyers concentrated at the departmental level with the general merchandising manager's responsibilities of coordinating and directing the merchandising efforts of an entire store. The divisional manager is the intermediate link in the chain of command set up in the merchandising division, sharing the burden of responsibility for any departmental failures. The divisional manager has an important supervisory job to perform in the merchandise planning and control process, one which is vitally dependent on access to complete and timely information.

### Control Division

The modern department store controller, besides being responsible for his traditional bookkeeping and reporting activities, is increasingly devoting his time to supervision of credit operations and to financial planning and

control.<sup>4</sup>

The controller's duties with regard to the maintenance of accounting records and reports involve the actual posting of ledger accounts; auditing of accounting procedures and records within the firm; responsibility for the receipt and disbursement of money for merchandise, service and supplies; supervision of physical inventory; preparation of statistical inventory; preparation and filing of tax returns.

The greatly increased emphasis on credit in retailing in the last decade and a half has increased the volume of credit to the extent that it represents a highly significant proportion of a department store's capital. A credit manager, directly under the controller is usually responsible for judging applicants for credit-maintaining credit records, preparing and mailing statements, receiving payments, and collecting overdue accounts.

The budgeting and control of merchandising stocks and operating expenses probably has become the most important part of the controller's work. Relying quite heavily on historical information regarding mark-downs, markup, stock sales ratios, open-to-buy, etc., the controller cooperates with the merchandising division in the formulation of the merchandise plan. Similarly, he works with all operating

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<sup>4</sup>W. R. Davidson and P. L. Brown, op. cit., p. 176.



divisions in drawing up the expense budget, which is the other significant component of the store's net profit. The plans for six-month periods are finalized two or three months in advance of the start of the season. Once the merchandising operations indicated on the seasonal plan begin, the controller is responsible for detecting deviation from the plan and taking appropriate action. Such action may involve the revision of existing plans in the light of unexpected circumstances.

### Publicity Division

The Mazur plan envisages the executives in charge of the publicity division, frequently called the publicity manager or advertising manager, being responsible for favorably presenting the store and its merchandise to the consumer. What is termed the advertising division includes people responsible for newspaper, television, radio, circulars, bill-board and streetcar advertising. Window and interior store displays, exclusive of counter displays, form another component of the total promotional activities. If a store has a public relations section as is included in this plan, its duties usually are concerned with special forms of sales promotion such as fashion shows, major anniversary events, auditorium shows, visits by famous personalities endorsing products, etc.

The main tasks of the publicity manager are to coordinate the work of his various assistants, to assume

responsibility for planning a sales promotion budget, and to control expense within his sphere. As previously mentioned, the general manager is concerned with general store policies and public relations; consequently, his advice is often sought in consultation on major advertising plans.

### Store-Management Division

The executive in charge of the store-management division who is variously referred to as the store manager, store superintendent, operating superintendent or service director, is responsible for a group of departments which may, for purposes of classification, be considered as related to the provision of proper service to the customer. In actual fact these departments often appear to contain all activities left over from the other divisions. The duties performed by the store-management division include the care and maintenance of the building and equipment; care and movement of merchandise; purchasing of supplies and equipment; operation of workrooms; protection of the merchandise and store.<sup>5</sup> In this plan, the performance of personnel work also is located in the store-management division.

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<sup>5</sup>C. W. Barker and others, Principles of Retailing (New York : McGraw-Hill, 1956), p. 175.

#### IV. ADVANTAGES AND DISADVANTAGES OF THE MAZUR PLAN

The Mazur Plan was initiated by the NRDGA after a short, hard depression that hit the mercantile field in the early 1920's had led this organization to the realization that inefficiencies due to poor organization were fairly widespread. The Mazur four-functional plan, through the provision for specialization in four important activities involved in store operation and the definition of authority and responsibility for accomplishment of objectives, represented an important step toward removing this structural inefficiency. The creation of four major divisional executives who usually are not only specialists in their fields but also have an extensive retail background and understanding of the broader problems involved, has tended to create a stable organization. This is true because the executive committee which is formed by the general manager with the four functional heads and often some major assistants, is often the medium through which a meeting of the minds results on major store questions. This helps to maintain a unity of command. In addition, the close contact that usually exists among the few top executives tends to create a continuity in management, in that any one of the four divisional executives is capable of assuming the responsibilities of general management should the need arise. Finally, because the

success of each division is dependent upon the operations of the others, this plan is said to set up a form of checks and balances through interdivisional cooperation. For example, one department could not expand its sales through excessive promotion because the manager of television advertising must adhere to an expense budget which had been previously agreed upon for the merchandising department in question.

Probably the strongest criticism of this type of plan has been that selling activities are split up amongst the merchandising, publicity and store operations divisions and it thereby is believed to weaken one of the major functions of retailing.<sup>6</sup> Supervision of sales people by the department manager, hiring and some training of personnel undertaken in the store-management division and the separation of publicity from the merchandising division, are all cited as evidences of this splitting of responsibility. Opinions expressed by store executives interviewed, indicated that the concern over splitting-selling responsibility is an academic one. It is also charged that publicity and control in reality are only activities intended to assist the major functions of buying and selling. Elevation of publicity and control to the status of major functions is thought to create an organization in

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<sup>6</sup>O. P. Robinson and others, Store Organization and Operation (Englewood Cliffs, N.J., Prentice-Hall, 1957), p. 35.

which overlapping authority and responsibility tend to create problems which divert the attention of management from the real purposes of business.

Having outlined a structure which has provided a basis for organization in modern retailing, some of the features of retail store organization in Vancouver will be discussed to highlight the deviations from the Mazur Plan.

## V. THE ORGANIZATION OF DEPARTMENT STORES IN VANCOUVER

### Introduction

In this section no attempt will be made to delve too deeply into the details of organization past the level of the functional head, except in the merchandising division. The object of the discussion of organization is to gain an understanding of the place of merchandising in the organization which is required to later appreciate the role of electronic data processing in retailing. The previous discussion of the Mazur plan provides a reasonably comprehensive view of the varying duties and responsibilities assigned to the different functional divisions in retail department stores. The intent here is to concentrate on the variations in organization.

### The Emergence of the Personnel Division

It is now generally accepted that the needs and

problems of department stores with regard to the selection, training and remuneration of personnel are such that a separate personnel function is required. Department stores require a widely fluctuating pool of employees for part-time work to provide proper customer service during peak periods of the week, as well as for periods of extraordinary activity such as sales and seasonal rises in business. The increased administration requirements connected with the temporary employees, as well as the growth in employee staff of department stores caused by increased scale of operations in the last two decades, has led to the decision in many stores to establish a separate personnel function. Coupled with the increased personnel problems has been an increase in the responsibilities of the store manager to the point where supervision of the personnel function, in addition to his other duties, would have produced a severe drain on his time.

Another major reason for the breaking out of the personnel function as a separate division was pin-pointed by one controller interviewed when he stated that somewhere in the neighborhood of 60 per cent to 70 per cent of operating expense of that store was made up of employee wages. The additional importance of this large segment of expense was underscored by the fact that the general manager of the store usually took a first-hand interest in studies of wage payment plans and certainly watched this item closely

in his review of store budgets.

Only one department store of the four studied did not have personnel as a separate functional division. This store, whose simplified organization chart is shown in Figure 3.4 included personnel under the store-management division, as did the Mazur plan.

### Branch Stores in Organization Structure

Accompanying the growth of the suburbs in Vancouver, has been the establishment of suburban shopping centers, with the hub of activities in these centers often being a branch store of one of the department store chains. As indicated in Figures 3.2, 3.3 and 3.4, three of the four department chains studied in the Vancouver area either have branch stores or are in the process of setting up branch stores.<sup>7</sup> The expansion of the chains into branch stores has brought new organizational problems.

In the Vancouver area branch stores are operated as outposts or satellites of the downtown or parent store. The branch stores are smaller than the parent stores and cannot be staffed in the same manner. As a result, many of the specialists found in the large stores are missing and the persons in charge of the branch store departments have a status comparable to assistant department managers in the main store. The parent stores often use these

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<sup>7</sup>Supra, Chapt. III, pp. 60-61.

positions in the branch store as a training ground for potential parent store department managers.

An individual department in a branch store often contains lines of merchandise which are the basis for several departments in the parent store, since the branch store merchandise classifications are not as narrowly defined. The parent stores assume the bulk of the responsibility for accounting, receiving of merchandise, pricing of merchandise, marking of merchandise, payment of invoices, unit control, and advertising.

Organizationally, the difficulty with branch stores is that there is not a direct line of responsibility extending from the branch store manager on down through the branch store organization. Rather, there is some fragmentation of responsibilities and, in fact, responsibilities are not clearly defined in many cases. The branch manager usually reports directly to the general manager or management committee which in Figures 3.2, 3.3 and 3.4 is denoted by using dotted lines. However, his real authority is limited and he is actually an on-the-spot coordinator of activities which are directed by the functional executives in the main store. Because he reports to the management committee composed of functional executives, the executives involved come to common agreement in case of conflict. The splitting of responsibilities in the branches admittedly causes some organizational difficulties but as yet



the parent stores have not settled on plans which eliminate this problem while providing the branch stores with the parent-store supervision they require.

All merchandising of branch stores is done by either the divisional merchandising managers or the general merchandising manager of the parent store. The floor employees in the branches have responsibilities primarily for selling and are controlled by merchandise executives in the main store. Selling generally improves in the branches because branch personnel have little or no responsibility or activities other than customer service. Uncontaminated by the refinements of modern retailing, they concentrate on selling.

### Publicity Division

Organization theorists have objected to separation of publicity from the merchandise division, insisting that this is simply the non-personal as opposed to the personal side of selling and, therefore, should rightfully come under the control of the general merchandise manager.<sup>8</sup> This is precisely the sentiment which was expressed by a divisional merchandise manager in the organization shown in Figure 3.2 when questioned on the placement of publicity in the merchandising division. It was felt that although

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<sup>8</sup> O. P. Robinson and others, op. cit., p. 45.

there was an additional work load placed on the head of the merchandising division by such a structure, there was a definite gain in that the publicity activities were better coordinated with the merchandising activities.

In sharp contrast to the latter structure, in Figure 3.5, advertising and display are shown as separate divisions on a par with merchandising, control, store-management and personnel. This is an example of how a position was planned to accommodate individual ability rather than an individual selected to fill a position, as organization theory favours. Despite the fact that these positions appear, organizationally speaking, of equal status to other divisional heads, in reality they are considered to be of lesser importance. The organization in Figure 3.4 also separates advertising and display but places both of these subordinate to the store superintendent who enjoys very broad management responsibility. Only one department store, that shown in Figure 3.3, combines all the publicity activities under one head, as was recommended by the Mazur plan.

#### Merchandising Division

In all merchandising divisions shown except one, the chain of responsibility in the merchandising division extends from the general merchandising manager to the divisional managers, to the department managers, to the assistant-department manager, if someone has been so

designated, and finally to the sales people. As shown in Figure 3.4, the position of general merchandise manager has been eliminated in one of the organizations. The coordinating role traditionally reserved for the general merchandise manager is eliminated in this organization through greater cooperation and bearing of responsibility on the part of both the general manager and the divisional managers.

Three of the organizations studied had their divisional managers in the parent store while the remaining store provided for six divisional managers. Again it was found that individual capacities and specialized talents were the basis on which departments were combined rather than strict adherence to homogeneity of product characteristics. In stores containing three divisional managers, the breakdown was roughly into fashions; housewares and furnishings; basement store and departments not handled by the other managers. The departmental store shown in Figure 3.5 was divided into ladies' fashions, small wares, foods and children's wear, men's wear, basement store, and big-ticket department (i.e. appliances, rugs, furniture).

Individually, the department managers are held responsible for some measure of profit, but in no local store is it the net profit of the department. The inability to delegate net profit responsibility to anyone

below the level of the general manager is one of the problems standing in the way of closer management control of retailing activity. In practice, department managers are made responsible for a profit contribution margin that is the difference between department revenue and what the store management defines to be the controllable costs. The controllable costs for which the department manager is responsible varies from store to store. The profit contribution margin may include amongst these expenses only the cost of merchandise delivered to the store, or may also include such controllable expenses as advertising, sales employee remuneration, workroom costs, wrapping expense, and travelling costs of the manager. Cost accountants have long recognized that the arbitrary nature of allocating such overhead expenses as power, heat, cleaning, etc., prevents management from holding the department manager responsible for net profit.

## CHAPTER IV

### ELECTRONIC DATA PROCESSING AND ITS RELATIONSHIP TO RETAILING PROBLEMS

#### I. INTRODUCTION TO ELECTRONIC DATA PROCESSING

##### Electronic Data Processing as a Means to Support the Planning and Control Function of Management

Today most businesses of appreciable size, whether in manufacturing, wholesaling, or retailing, work with literally millions of facts--facts relating to customers, items of merchandise, employees, and suppliers. Large retailing establishments which exist in an intensely competitive field characterized by small operating margins, must somehow come up with solutions to the problems contained in these riddles of facts, to produce a profit for the shareholders.

Basically, the retail work load revolves around the processing of merchandise into and out of the store. Stores receive goods either from vendors or as returns from customers and they send out goods as a result of sales, returns to vendors, or transfers to branches. Purchase orders, receiving records, price tickets, customer credits must all be written to bring goods into the store. Cash registers must be rung, sales checks written and

certain other documents created to effect returns to vendors and to record transfers. The by-products of these operations are the accounts payable records and payment vouchers, customer accounts and billings, stock ledgers, unit controls, departmental merchandising and operating statistics, open-to-buy controls, employee records and so on.

Relating the retail work load to the spectrum of decisions which was discussed in Chapter II, at the lower end of the decision spectrum are the simple routine decisions such as determining whom to bill, how much to bill him, and whether or not a discount is applicable, whom to pay and so on. Toward the middle of the spectrum are the more complex but still fundamentally mechanical decisions, in the sense that they allow some possibility of breaking the decision down into a number of small related decisions. These decisions include the determination of when to order merchandise, how much to order, when to have it shipped out and how to ship it. At the upper end of the spectrum are the extremely complex managerial decisions on such questions as whether to diversify the merchandise line, where to locate new stores and how much to invest in an undertaking.

From the initial recording of the facts to the end result of the processing, the data is handled and re-handled many times and at great expense in the retail operation. When each of the details recorded is expanded

in terms of number of digits required to classify each customer, stock-keeping item, employee and to prepare the various reports, the record keeping problem is compounded many times. If all these record keeping activities could flow automatically from the original documents which initiate the basic functions of the business, a great reduction in the clerical staff could be realized.

The reports produced in the course of all this accounting activity have a common purpose--to facilitate the operation of business by upgrading the quality of executive decisions. The management planning and control function in modern business requires that timely information vital to the conduct of operations be available to provide an intelligent basis for making decisions. The continuous improvement in the electronic digital computer, as well as the equally important peripheral equipment, has resulted in their being applied to an increasing number of business problems since the early 1950's. This equipment represents tools which have acquired an important place in management's technical repertoire to compile pertinent information rapidly and accurately.

The purpose of this chapter is to investigate some of the characteristics and problems inherent in retail data processing, as well as to review some of the more common current applications of electronic data processing (EDP). Before discussing this, however, it is necessary

to briefly review some of the more prominent characteristics of EDP equipment. A considerable vocabulary has been developed in conjunction with this equipment and it is assumed that the reader has some prior knowledge of EDP concepts.

### Concepts Involved in Electronic Data Processing Systems

System components. An electronic data processing system consists of five basic elements: input, storage, control unit, arithmetic or processing unit and output. The computer program once entered into storage in machine language represents the list of instructions according to which the data will be processed. Physically, this entire processing operation is accomplished by means of a digital computer as well as peripheral equipment.

Programming. One generally proceeds through three distinct phases to produce a workable computer program. In the first phase, the problem that is to be solved must be isolated and analysed, this analysis being virtually independent of the methods used to process the data. Next, the logical sequence of steps required to solve the problem is either explicitly detailed by means of a flow chart, or may be arrived at implicitly by more experienced programmers without committing these thoughts to the more concrete flow chart format. The final phase involves the coding of the method of solution, either directly into the prescribed



computer code or into some automatic programming code which is subsequently reduced to the so-called machine "language" or code by means of another computer program. Once this has been done, the list of instructions for carrying out a sequence of desired operations, called the program or routine, is entered into machine storage in a coded form, this form being a function of machine design. The coded program is, therefore, closely related to the equipment and processing flow methods used.

Electronic data processing relies on the ability of the modern electronic digital computer to perform, in sequential order, the series of operations that are logically enumerated in the computer program. The program tells the computer when to operate, how to get data, what data to take in, what to do with the data taken in, when to perform specified operations, what to do next, and when to stop. The theory of computer programming which in concept appears quite simple, in actual fact is an area of considerable depth and complexity. This subject is adequately covered by a quickly growing number of books available today.<sup>1</sup>

Although a company which operated an EDP installation will almost certainly have trained people to do the required programming, in view of the expense involved in

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<sup>1</sup>D. D. McCracken, Digital Computer Programming (New York : Wiley, 1959); L. W. Hein, An Introduction to Electronic Data Processing for Business (Princeton : Van Nostrand, 1961).

programming and because of the high degree of similarity of some applications such as payroll and accounts receivable, so-called library programs or programs already written for such a problem may be obtained for a fee from the manufacturer. An EDP installation in time accumulates its own library of programs for using in data processing situations that recur on a regular basis. The programming systems and library programs provided by equipment manufacturers, the so-called "soft ware" as opposed to equipment or "hard ware" have become an integral and very important part of the manufacturer's total EDP package.

Input. Business data processing systems must handle a large volume of transactions data relating to payroll, sales audit, merchandise control, accounts payable, etc., which may originate in various forms and in widely separated locations. The input function of the electronic data processing system permits coded data, whether it is transactions data or instructions, to be read into the system. A wide variety of input media may be used to perform this input including manually operated keyboards, punched cards, perforated price tickets, magnetic tape and punched paper tape. These input media are processed by a number of peripheral electro-mechanical equipment essential to the creation and conversion of coded data input. The equipment creating coded data input include direct input keyboards, paper tape and card punches,

magnetic tape writers, merchandise tag readers, and optical and magnetic character readers. The conversion equipment sometimes used included punched cards to magnetic tape converters, paper to magnetic tape converters and paper tape to punched card converters. At the proper time in the sequence of operations specified by the program, data is read in and the program directs and controls the computer operation, the result of the computation being disposed of in a manner determined by the program.

Conversion to magnetic tape is often favored in the data flow procedure in an EDP system to compensate for the disparity in reading times for cards or paper tape, as compared to the computation times required for the conventional business problem. Business data processing typically involves a few relatively simple computations which can be done in the order of four or five times faster than data from paper tapes or cards can be read into the computer. To prevent wasting valuable computer time a conversion to magnetic tape, with its significantly higher reading rate, is made before inputting the data into the computer proper. This "buffering" operation tends to alleviate a potential "input limited" situation in which the computer's ability to output information outstrips its ability to read the data into storage. Buffering is also done in "output limited" cases in which the mismatch occurs between the computation and output ability of the system.

As applied to retailing operations, there are generally three methods of processing data input.<sup>2</sup> The most sophisticated means, here referred to as on-line processing, in the jargon of the computer manufacturing field, is termed "real-time systems" by Remington-Rand and "teleprocessing" by IBM. In concept, and ignoring the technical problems, on-line data flow is deceptively simple. Data in this system go directly to the processing unit with no intermediate stages of classification or sorting between the organization of data and completed processing. The accuracy of input data is increased because people do not recopy data from original documents. For retailers this suggests the use of point of sales recorders such as specially designed cash registers or source document input involving automatic character recognition, which transmit the data directly to the central computer. The data would be analysed and, where applicable, instruction data sent back to control and direct activity according to a pre-established program. Automatic character recognition techniques, both magnetic and optical, are at present capturing considerable interest in retail trade periodicals as a means by which data from journal tapes or sales checks may be used as direct input to the system. The April, 1964 issue of Retail Merchandising in fact explains how the optical scanning method

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<sup>2</sup>R. H. Gregory and R. L. Van Horn, Automatic Data-Processing Systems (Belmont, California : Wadsworth Pub. Co., 1960), p. 294.

is being successfully employed in Steinberg's Montreal department store.<sup>3</sup>

The random access memory feature, which will be mentioned later, is required to operate on the various accounts affected by the input data in the order in which the data is introduced into the system. Unfortunately, the necessity to replace the present point-of-sale devices with new recorders and the cost of random access storage has, in the opinion of most retailers, required an investment completely out of the proportion to the resulting savings and efficiencies. In summary then, this processing method is a technique of recording and completely processing a transaction at the time it takes place rather than delaying processing, possibly by batch handling as is done in the traditional accounting fashion.

In-line processing, the second general method of input is defined as the processing of data without sorting or treating in any way other than temporarily storing them. Transactions are accumulated for processing later, but the original sequence is unchanged for only temporary storage is involved. An example of this type of processing is use of punched paper tape which is created as a by-product of cash register operation and which, at the end of the day, is removed from the register to be used to update the master files of the account classification affected.

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<sup>3</sup>Retailing Merchandising, 16, No. 4 : 21, April, 1964.

The same types of points-of-sale recorders as can be used with in-line processing are also applicable here except that the data does not go directly to the central processor. In-line processing may be thought of as on-line processing done under relaxed time requirements.

Again, cost is an important factor and certainly an abrupt change over to tape equipped registers represents a substantial investment. One local executive estimated that under present conditions a change over to new equipment for Vancouver operations would require an investment in the order of a quarter of a million dollars. Comprehensive on-line and in-line systems, for various reasons not the least of which is cost, are still in the developmental stages.

The third and crudest means of input involves document translation, accumulation (i.e. batching) and rearranging of data, perhaps by sorting, before they are processed. Data from the source document is key punched on paper tape and punched cards. Unfortunately, this is time consuming, error generating and consequently expensive. In addition, the necessity of sorting transactions for off-line processing involves additional delay. Yet this method is presently the most economical and widely used in retail data processing today. In later applications of data processing for this thesis, processing of this pattern is assumed.

Arithmetic or processing unit. The processing unit performs normal arithmetic functions such as addition, subtraction, division (by performing iterative subtraction) and multiplication (by performing iterative addition). Techniques of numerical analysis also permit other mathematical functions and calculations to be performed. In addition, the arithmetic unit is capable of wide variety of logical operations. These simple operations which form the basis for all computation are carried on according to the program under the direction and timing of the control unit. Retailing problems generally require little and relatively simple manipulation of a mass of data.

Storage. The function of storage in an EDP system is quite simply to preserve data in a recognizable form. In order to achieve some sort of balance between conflicting factors of storage capacity, access time, cost and erasability, some sort of compromise must be made between different types of storage. In larger-scale data processing equipment, three types of storage, often referred to as internal storage, secondary storage and external storage, are commonly used.

Internal storage or what is frequently called "memory" holds the computer program and data currently in use within the computer. This terminology persists despite the fact that all types of storage are, technically, memory devices. The internal storage facilities form an

integral part of the data processor and the storage locations are addressable either by word or by field. The data are read directly from internal storage to the arithmetic and control unit for processing.

Secondary storage supplements internal storage and, while not an integral part of the data processor, it is directly connected to the processor and controlled by it. Some secondary stored is called random access which was mentioned in connection with the discussion on input. Technically, random access refers to conditions in which the next storage location from which data are to be obtained does not depend on the location of previously obtained data. This is random as opposed to, say, serial access of magnetic tape where tape speeds and location of data on the tape determine access times which obviously will be variable. In general usage and in the instance previously cited, random access was loosely used to mean a relatively low and approximately equal access times to a large volume of data. Secondary storage is important for holding large master files for processing transactions that occur in random sequence such as the proposed on-line system for retailing. The contents of secondary storage are transferred to internal storage before processing.

External storage facilities are divorced from the data processor itself; they hold large amounts of data at



low cost in forms suitable for processing. Such storage media as magnetic tape, punched cards, and paper tape are widely used as external storage but which also rank as secondary storage when connected to and controlled by the computer for reading or writing.

Output. The output function produces the results of the data manipulations. Printed output may be accomplished by the use of electric typewriters or high speed printers, depending on the requirements of the installation. Other forms of output, usually for storage or subsequent processing, include magnetic tapes and punched cards or punched paper tapes.

The ability to program the computer to scan files for significant information in the process of updating files, permits use to be made of exception reporting. Because an EDP system can output great volumes of data in comparison to manual systems it soon became obvious that exception reports, such as reports to the credit manager on over-budget or delinquent accounts and reports to the buyer, divisional manager or general merchandise manager on poor stock or sales situations, were the only manageable means of providing information. This thesis will be concerned with output problems of this nature rather than problems of file maintenance.

Control. Throughout the discussion of the other four functions, the control function has been implicitly

referred to. The coordination and use of any of the other functions is determined by this unit which does all of the directing and switching to initiate a program and carry it through to the completion of operations.

## II. RETAILING AS A FIELD OF APPLICATION FOR ELECTRONIC DATA PROCESSING

### Characteristics of Retail Data Processing and the Role of Electronic Data Processing

Data processing in retailing is distinguished by a very large volume of low-unit value transactions, which in the last decade has expanded considerably. Because of this characteristic, an increase in the absolute number of errors when data is handled manually, is to be expected. Such a situation in business can lead to considerable loss in clerical time required to check errors, embarrassment for the company, and loss in customer good will. Fortunately, the solution of such problems is the forte of modern electronic equipment since, providing the input data is correct, a variety of built-in controls ensure the correctness of the output. Mechanized equipment such as point-of-sale recording devices which capture original source data before rehandling provide the means of achieving greater accuracy at the point of data origin.

The series of individual operations involved in creating documents and posting records in various departments as a result of some business event, such as the

initiation of an order by a customer, is another prominent characteristic of retailing operation. Department stores are divided into functional divisions, as noted in Chapter II, with functional activities inter-related. However, the people in each function are primarily concerned with their own function rather than getting an over-all view of operations. Such a situation contributes to fragmentary data processing.<sup>4</sup> Where this occurs documents and reports that may vary only slightly in content and timing, are often wanted in different departments, thus requiring the preparation of entirely new copies to make slight changes. Fragmentary data processing is expensive because of the inefficiency that stems from the repetitive operations and file duplication involved in storing and handling records in each department.

The above mentioned series of operations required to process business data frequently involves considerable reclassification of data and the need to make numerous relatively simple logic decisions. The obvious way to increase the efficiency of data processing is to mechanize the operations duplicated at each stage. The concept of mechanizing repetitive operations is one element of

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<sup>4</sup>R. H. Gregory and R. L. Van Horn, op. cit., p. 289.

"integrated data processing," the other being the elimination of duplication or fragmentation.<sup>5</sup> The integrated data processing (IDP) concept evolved primarily because the cost and effort required to mechanize procedures using EDP equipment dictated that processing procedures be devised which capitalized on such obvious strengths of electronic computers as speed, accuracy, and the ability to follow internally stored programs which incorporate sequential calculations and logic operations. Although integration does not specifically require that electronic equipment be used, common usage of the term "integrated data processing" now carries with it the implicit acceptance that electronic equipment will be used. In a fully integrated system, accounting operations such as payroll, sales, accounts receivable, inventory control, etc., are performed without interspersed manual operations. In retailing, the IDP concept would require point-of-sale recorders coupled with a system of on-line or in-line processing. However, integration is a relative term and certainly there are degrees of integration.

The really significant point to note about the IDP concept is that it represents a broad point of view. Rather than emphasizing EDP equipment as so many writers did at an early stage of application of electronic equipment to business, the IDP concept represents a relative

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<sup>5</sup>L. G. Ifft, "Integration of Data Processing and Its Impact on Accounting," NAA Bulletin, 44:17, September, 1962.

de-emphasis of equipment. The adherents to this concept strive instead to devise efficient total accounting systems of which EDP equipment is only one very crucial component and, in fact, the component that usually provides the impetus for such system changes. Viewed in this context, IDP represents really an inevitable maturing that occurs concurrently with a lessening degree of mystery in men's minds regarding the principles of EDP equipment operation.

The large volume of data accumulated by business organizations has quite naturally led to large volumes of output information. Mechanization of accounting procedures has speeded up these operations, as well as opening up new possibilities for securing business information which previously was too costly or time consuming to obtain. While high speed data processing and data output have encouraged an increase in the information available to managers, the ability to program computers to output only exception reports has, on the other hand, made it possible to eliminate a great deal of information output.

Another characteristic of business data processing of particular importance to retailers is the frequent change in the basic data with which the company works. Data such as customer names, addresses, prices, merchandise classifications, employee names and wage rates, etc., are constantly being altered. The more highly mechanized a data processing system becomes, the harder it is to cope

with these changes. Attention must therefore be given to reduce or more efficiently handle these changes in basic data so as not to offset the advantages of faster equipment.

Because of the diversity of its inventories and the large number of customers and vendors who figure in the basic transactions, retail business is also characterized by the need to store larger volumes of inactive information relating to business activity than other businesses of comparable size.<sup>6</sup> The data retention and reference problem associated with this need in many businesses necessitates storage of voluminous files and records while information is often retrieved only at considerable cost in terms of time and money. This information may be of the temporarily inactive variety (i.e. names and addresses of customers, accounts receivable ledgers, inventory control records) or permanently inactive information which consists largely of completed business transactions. In electronic processing systems this information can be stored much more conveniently and compactly with access to selected information more readily obtainable than is possible with manual systems which are still widely used.

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<sup>6</sup>V. J. Dankis, "Random Access Equipment - Its Effect Upon Accounting," NAA Bulletin, 44:37, December, 1962.

### Objectives of Management in Acquiring Electronic Data Processing Equipment

The EDP investment through management eyes. Inherent in the characteristics of retail data handling problems are quite obviously some of the objectives that management hopes to achieve through the introduction of EDP equipment and the criteria by which this investment is judged. Occasionally, the acquisition of EDP equipment may be prompted by the prestige factor. The president or perhaps controller, has after a cursory examination of the subject, recommended that a study be done on the matter for the purpose of installing new equipment. But how would intelligent management examine this question and what would be their basis for making a decision?

Underlying any management evaluation must be a balancing of benefits as opposed to costs. Some weighting must be assigned all benefits and costs despite the fact that in this case both are partly tangible and partly intangible in the sense that they may or may not be measurable. Since information and reports are rarely bought and sold, "prices" are not available thus presenting some unique valuation problems. The benefits and costs factors, it must also be remembered, have reference to both present and future conditions and some decision must necessarily be made as to the extent that future conditions will colour one's judgment. Potential savings, which may be only wishful thinking, have been much in evidence in

reports on unsuccessful installations.

One must keep in mind that from management's point of view investments in EDP installations are subject to the same return on investment formulas as are other projects<sup>7</sup> and before any return on investment analysis can be done careful consideration must be given to what often has been over optimistic saving and cost estimates. Management must determine if the project conforms to company capital investment policies, that risk is taken into account along with potential benefits, and that all cost factors are realistically included. In recent years, management has also been more cognizant of the fact that discounted rate of return calculations which compensate for deferred benefits and costs, recognize economic realities to a greater extent than do outmoded payback and book rate of return investment calculations. Therefore, claims of potential savings by the discount methods are more logically integrated into the cost analysis. Once cost estimates are determined as essentially correct, if the results are favorable it is often relatively easy to judge whether or not the company can afford the investment on that basis alone; however, the ability and willingness to carry out the program and change business methods are less easily determined.

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<sup>7</sup>"Management Role in Electronic Data Processing," Industrial Conference Board, Studies in Business Policy, No. 92, p. 25.



As mentioned, much of management's thinking on these questions is affected by its bias or lack of bias. Assuming a pragmatic point of view on the part of management, some of the tangibles or intangibles they would consider will be enumerated.

Tangible management considerations. The increased interest on the part of many retailers in the use of more advanced data processing equipment and techniques has been stimulated by several factors which have emerged from experience gained in the data processing field. Although much has been made of the increases in productivity in such fields as the manufacturing and processing industries where automated equipment has made possible a sizeable increase in output per man hour, the clerical labour field has enjoyed no such benefits to offset the increasing wage scale. This, coupled with the expansion of paper work due to the growing complexity of business mentioned earlier has resulted in an increasing recognition that success or failure may very well depend on management's ability to control clerical labour costs.

Recent studies clearly point to sizeable reductions in computer costs and experience in some areas has demonstrated a reduction in per unit cost of some thirty times between 1957 and 1962.<sup>8</sup> These facts are causing a

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<sup>8</sup> "Latest Developments in the Field of Data Processing," Retail Control, 32:8, March, 1963.

continuing reappraisal by many organizations regarding the feasibility of using a computer. Data processing applications which were judged to be too costly for computer processing a few years ago are being re-evaluated in the light of today's lower per unit cost and quite frequently they disclose EDP can now offer definite advantages.

Another factor that has a bearing on the cost and efficiency aspects of EDP operation is company experience relating to the scale of the installation. The large scale computer facilities supported by large businesses have generally proven to be capable of handling data at lower per unit cost than small installations. As a point of reference, large scale facilities might be considered as those possessing the processing capabilities of the IBM 7000 series computer, while small scale facilities would be in the IBM 1400 series range. To the knowledge of the author, no large scale facilities as defined by the above criterion now exist in the Vancouver area. The effectiveness of large centers is not due solely to the more efficient processing capacities of large computers. Considerable advantages exist in the level of technical skills which can be supported by large centers. Small facilities with small technical staffs are less able to attract top calibre technicians so essential to the effective operation of a data processing center. Even though there are many well-run, small facilities

managed by very capable people, it has become increasingly evident that the failures in the data processing field, and particularly in the small computer field, are due far more to bungling by poorly equipped technical people, than by deficiencies in the equipment itself.

Dealing more with specifics, the most obvious cost components involved in EDP installations are, of course, those of the computer itself and peripheral equipment. Although this equipment may be bought outright, the large initial capital outlay and the rapid rate of technical obsolescence of equipment due to the accelerated development in this field have tended to discourage this approach. The more conventional arrangement for the company operating its own installations has been a leasing arrangement with the manufacturer. In view of the preceding questions raised regarding the effectiveness of small centers, many businesses in Vancouver utilize facilities of an established service bureau operated by equipment manufacturers to handle data which lends itself to off-the-premises processing. While it is possible for a service bureau to provide the facilities of a large scale computer and competent technical assistance otherwise unavailable to the small user, the problem of off-the-premises processing of data by an outside agency frequently presents unique systems problems. These problems may nullify the advantages or violate policies regarding the protection of proprietary information. Another alternative

which has been used to a limited degree in the United States is the establishment of a participating center whereby a group of retailers with common problems have banded together in community programs. So far, these installations have given encouraging signs of success.

For owner operated installations, another cost component to be considered is the maintenance cost. EDP equipment is delicate and complex, requiring a high degree of technical know-how to locate and remedy equipment malfunctions. Equipment manufacturers maintain a competent staff of technical personnel and the conventional leasing agreement provides for a servicing arrangement.

Programming costs and expenses involved in the initial trial period of operation has, in the past, been a frequently neglected factor. This is understandable as lack of previous experience may very well result in a underestimation of the complexities involved. Because these problems are a direct function of the technical competence of programmers and operators, this cost can be highly variable. It is in the nature of a training cost which, because of the shortage of qualified personnel, is often unavoidable.

Another expense sometimes neglected is that involved in operating the EDP system and the old system in parallel for a period of time. This is known in the technical jargon as the "debugging" period during which time problems

that might have been previously overlooked are eliminated from the system. EDP systems, once operable, function quickly and efficiently providing everything runs smoothly. Malfunctions can cause chaos at critical peak processing periods and result in inconvenience to customers and the business alike. One local department store controller cited the experience their organization had with a supplier who had hit a snag with its newly installed computer. This supplier, after having considerable difficulty with its accounts payable operations, had in desperation informed its customers to pay their accounts according to what was thought to be owing. Needless to say, this same department store which was in the process of ironing out the kinks in its own newly installed equipment had made provision for the parallel operations of its systems for a suitable period of time.

The feasibility study which should precede any installation requires an outlay which varies in proportion to the scope of the study. Those stores which require an extensive revision of systems naturally will have to budget for a much higher outlay than the store which has undertaken a continual revision of accounting systems to meet changing circumstances. The latter organization, in addition, is much more likely to be able to rely on personnel internal to the firm who are qualified to handle the systems study.

Finally, the personnel operating costs and the costs of materials such as printing forms, cards, tape, etc., must be investigated to determine the continuing expenditure that the installation requires.

The most notable cost savings which could result from an EDP installation would be through the reduction in the clerical personnel required and the saving inherent in better inventory control. The lower investment in inventory coupled with increased turnover ratios and the decrease in the amount of markdowns that have to be taken is felt to be the area of retailing today where the greatest strides can be made. This particular point will be expanded later.

The introduction of new capital in the form of EDP equipment to the clerical procedures of business has increased the productivity of operating personnel several times, this increase being a function of the degree of mechanization and integration. Of particular concern to retailers is the need to stop or reverse the trend of expense percentages in the last decade. A Harvard research report on retail department stores in the United States has revealed that expenses have been taking an increasing bite out of the sales dollar.<sup>8</sup> This is a trend which many

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<sup>8</sup>M. P. McNair and E. G. May, "The American Department Store, 1920-1960," Harvard University Bureau of Business Research Bulletin: No. 166:51, 1963.

retailers in Canada agree is also true in this country. Cutting down on clerical costs is an important step toward rectifying this situation.

Intangible management considerations. The intangible factor most commonly mentioned in connection with EDP installations is the changed methods of management control. EDP presents new opportunities for planning the form content and timing of reports which previously may not have been economically available to management. In fact, so much information is made available, it is necessary for management to guard against overindulgence in report generation. The benefits of the increased control are by no means completely intangible as the potential for decreased inventory investment referred to above points out. The increased speed and accuracy synonymous with EDP methods in some respects represent both tangible and intangible benefits.

The centralization of data processing that may be required to get a sufficient volume of transactions and the integration usually necessary for successful automating of procedures may alter work flow relations in departments or geographically separated units. The alteration in practices to meet the requirements of the computer system can meet with considerable personnel resistance. Firm management support must therefore accompany these changes. Another point to consider is that the tendency toward

centralization may be contrary perhaps to a general policy of decentralization.

The speed and accuracy of the new equipment is felt by many users to lead to improved customer service, thus promoting customer good will. Although obviously this could be a significant factor, understandably management is loathe to attempt to justify its investment by relying too heavily on such nebulous considerations.

Cost estimates arrived at in these studies which attempt a balancing of costs and benefits are, at best, only rough estimates and especially so without considering specific equipment. Once the tangible investments versus cost savings have been estimated, inevitably the decision turns on some value judgment by management in evaluating the net cost versus expected intangible benefits. This is a decision which can only be made by those who are intimately familiar with the particular operation. Local opinion as to the factors to be weighed in making the decision, place little faith in hazy future benefits. The executives interviewed have, in the case of Vancouver installations, based their expectation of reaping net tangible benefits within a year or two of operations.

#### Application of Electronic Data Processing in Retailing

K. R. Lavery, at the 1963 Controllers' Congress Convention sponsored by the National Retail Merchants' Association (NRMA) revealed some interesting results his



firm had compiled on the use of electronic computers installed or on order in merchandising organizations.<sup>10</sup>

This study indicated that in 1960 there were four computers in department and specialty stores in the United States; by 1962 this total had increased to 78. The applications on these computers which have had to justify the expense of the EDP installations are:

	<u>applications</u>
payroll and accounting	22
merchandise control (open-to-buy)	19
sales audit and analysis	18
accounts payable	17
accounts receivable	14
others	3

The study further notes that, based on recent department store operating results, the expenses as a percentage of the sales dollar for various expense components are:

merchandise planning and control expense	5%
receivables (credit and billing) expense	2%
payroll and accounting expense	.6%
sales audit and accounts payable expense	.2%

Because merchandise planning and control expense accounts for 63 per cent of the total above expenses and only 19

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<sup>10</sup>K. R. Lavery, "The Future Role of Computers in Retailing," Retail Control, 32:37, September, 1963.

out of 93 applications or 20 per cent, are concerned with merchandise control, these studies highlight an area where, it is suggested, considerably more can be done.

The rapid decline in equipment costs that has been particularly evident in the 1960's has done much to change the complexion of the scope of the computer applications. In the 1950's when costs were relatively high, manufacturers were of the opinion that the best applications for a computer in a retail store were those which required logic such as sales audit, inventory classification or merchandise information, and sales analysis.<sup>11</sup> Applications which required a great deal of print out but a limited amount of logic and were therefore thought to be of marginal application for the computer were accounts receivables, accounts payables, and payroll.

These opinions were contrary to what was usually done at this time by the few installations that were operable. The applications were concentrated in the latter accounts receivables, accounts payables, and payroll applications. Now, however, because of decreased costs, these applications are generally conceded to be the areas where EDP systems can be profitably employed. Two of the four major department stores in Vancouver which have local installations, undertook their systems

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<sup>11</sup>Electronic Data Processing for Retailers (New York : NRMA, Retail Research Institute), pp. 9-35.

conversions to handle data processing of accounts receivables, payroll, and accounts payables in that order during the initial stages of their operation.

But still the anomaly exists--why, when merchandising seems to be such a potentially fruitful area for application of EDP, has there not been more done? Locally, although executives expressed interest in the possibilities for this type of application, little had been done or is planned in the near future for the mechanization of this area. The problem will be examined in the next chapter, particularly with respect to fashion merchandising which appears to present especially promising opportunities. In all fairness to local retailers, it should be mentioned that the lack of progress in this area is due in no small part to inherent instability of the fashion merchandising field. The problem is one for which there is no simple solution.

### III. SOME MAJOR PROBLEMS IN RETAIL DATA PROCESSING

#### The Lag of Retailing in the Introduction of Electronic Data Processing

Current periodical literature of the retailing field such as Retail Control, Retail Merchandising (formerly Canadian Variety Management) Stores and Journal of Retailing, contain articles in each issue which enthusiastically explain, question and endorse the principles of

EDP. Lively discussions of this sort are usually indicative of a healthy advancement in human knowledge and the development in question is no different. Yet the inescapable fact remains, retailing as compared with other industries has lagged in the adoption of EDP. Again referring to Mr. Lavery's address,<sup>12</sup> he cites the following statistics regarding the use of computers in the United States:

	total computers in use at end of year	number of computers installed or on order in all retail merchandising organizations	number of computers installed or on order in department and specialty stores
1960		10	4
1961	8,800		
1962	13,500	483	78
1963	20,000		

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The same pattern reflected in the above statistics is equally true in the Vancouver area. Business outside the retail trade have incorporated EDP methods into their operations, both at a much earlier date and in greater numbers than was true of the retailers. Companies such as Kelly-Douglas, B. C. Telephone, McMillan-Bloedell and Powell River Company Limited, B. C. Electric, to name only a few, have been using EDP equipment for some time.

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<sup>12</sup>K. R. Lavery, op. cit.

Measured by numbers alone, the comparisons are not very favorable for the retailers. The intention here shall be to try to determine some of the reasons for their late start by examining some of the major problems which have impeded the more rapid application of the new techniques.

### Retail Data Processing Problems

The feasibility study and system problems. Company experience in EDP applications have shown that a necessary prerequisite to a successful installation is careful and thorough advance planning which has the active support and participation of top management.<sup>13</sup> An explicit management statement of the objectives and statement of the criteria by which the feasibility of the project is to be determined represents important contributions of management in shaping the scope and depth of the study. In addition, management must arrange for the organization of the study group which should include competent men from the various departments affected, it must ensure that the group have access to the required data, it must provide the funds needed for the feasibility study, and, finally, it must establish the permanent organization for computer operations. This includes the definition of its responsibilities, authority, and relationship to other company units.

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<sup>13</sup>H. C. Vournas, "Avoiding the Pitfalls of EDP Installations," NAA Bulletin, 44:49, May, 1963.

An extremely important phase of the feasibility study is the study of current systems and procedures. The design of sound internal systems which achieve the integration necessary to efficient mechanized data processing is based on the analysis of present systems and the discovery of those deficiencies that can lead to recurring problems unless eliminated.

Manufacturers have expressed the opinion that projects in retailing were rarely thought through properly, they were poorly coordinated, and it was necessary for the manufacturers to deal with "too many bosses" in a retail organization.<sup>14</sup> They felt that if there was an individual assigned the responsibility of installing the equipment for his organization, who in turn could coordinate with other divisions of the store, installations would be made more smoothly and more economically. Further, it was felt that accounting systems should be subjected to regular reappraisal and revision as has been the practice in manufacturing companies who, as a group, have made the transition to EDP equipment much more easily than retailers. This practice unfortunately has not been similarly adopted to any great extent by retailers and all too frequently accounting systems have been allowed to evolve sporadically. Changes of methods in practice often are made

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<sup>14</sup>Electronic Data Processing for Retailers, op. cit.

solely on the basis of expediency which has resulted in procedures containing a multitude of exceptions and special-handling situations. A comprehensive over-all review of accounting systems might serve to eliminate the need for as many exception situations. Such reviews have the additional merit in providing a training ground for development of competent personnel so essential to a successful installation.

A typical pattern for EDP development has been a piecemeal approach of starting with perhaps one application such as accounts receivable and gradually expanding to include other applications as more proficiency and confidence are gained.

This is indicative of an approach which fails to consider the data processing problem in its broader outlines and is felt by at least one local equipment manufacturing executive to be an inadequate solution to the problem. This piecemeal method is similar to that followed by local installations as well. However, because of the limitations of personnel faced by those attempting to obtain a qualified staff locally, a broader approach has been very difficult.

#### Standardization of procedures and classifications.

Because EDP systems have the capability of operating quickly and accurately, large work loads become keyed to

tight time schedules in order to obtain maximum benefit from the machines. This situation puts the onus on management to design their systems to handle exceptions which can tie up processing at crucial times. The mutilation of source documents which would require manual rather than mechanical reproduction is an example of an exception situation which should, with foresight, be prevented from slowing down processing.

An associated problem is the regimentation of procedures necessary to the correct preparation and subsequent handling of data. One department store controller expressed the opinion that point-of-sales recorders might be difficult to use in an EDP system because of mishandling of the equipment by the relatively untrained personnel operating them. A problem such as this can be best solved by going directly to the root of the problem, namely, providing a proper training program to ensure a standardization of procedures.

The complete classification of personnel, customers and merchandise is another feature of the department store that could yield significant returns if improved upon. There is a definite trend today toward numbering systems so essential to the sorting, classification and processing of data in business systems. Rather than having an ever-growing variety of numbers such as a birth certificate number, hospital insurance number, unemployment insurance



motor vehicle operator's permit number, etc., it would be much simpler if each person had one number assigned to him which would identify him in a positive and unique way in all his dealings. A local EDP manufacturing executive suggested that the concept of a single identification number being assigned to an individual from the cradle to the grave is not too unrealistic as the newly implemented social security numbering system in Canada might very well form the basis for such a universal numbering system.

The impact on the retailer of this numbering system could be significant. Business would then be in a position to omit addresses on forms for wages, tax deductions, pension deductions, union dues, etc., and would merely send a listing of the appropriate deductions to the affected agencies in the form of reels of magnetic tape. The easier identification of people through uniformity in, for example, an individual's store credit account number and bank account number would facilitate identifying customer payments on account. Further benefits that could conceivably come from this numbering system are new methods of marketing analysis. At periodic intervals reels of magnetic tape containing only the customer account number would be sent to the census bureau in Ottawa which, for a modest fee, would provide an analysis of customers by sex, age group, marital status, age and sex of children, income and other socio-economic data. The value of such an

analysis both by itself and compared with previous similar analyses would be substantial in terms of developing current merchandise policies as well as longer range strategies.

Similarly, the classification of merchandise and the use of a code system, preferably a universal code system used by all manufacturers, would simplify considerably sales analysis and accounting procedures connected with ordering, receiving and marking of merchandise. Efforts to install universal numbering systems to identify merchandise and vendors which would be accepted and used throughout the industry are being implemented on a limited scale in the United States.<sup>15</sup> Department stores studied did have fairly complete numbering systems in fashion departments but as yet no comprehensive merchandise classification system is used on a store-wide basis.

Input problems. It is generally believed that the great breakthrough in automation for the retail industry will be the ability to capture relevant account number and sales check data economically in machine language at the point-of-sale. By using the by-products of this transaction data, all the benefits of integration of procedures and full classification of people and merchandise can be realized. There presently exists an imbalance

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<sup>15</sup>E. Langtry, "Standard Pre-Marking of Lingerie," Retail Control, 30:3, March, 1962; "DUNS Vendor Numbers," Stores, 46:23, June, 1964.

between input preparation and input editing on the one hand and actual data processing on the other. At the present state of the art, the input preparation and editing costs considerably more than does the actual processing through the computer. It is hoped that this cost situation can eventually be remedied with economical point-of-sale recorders.

The manufacturer-retailer relationship. A retailing executive at a National Retail Merchants' Association Conference several years ago illustrated the communications problem which existed between equipment manufacturers and retailers.<sup>16</sup> He recalled an incident which occurred during the preliminary meetings with a group of engineers the manufacturer had sent to discuss some of the systems' specifications for a proposed EDP installation. After laying out the flow of information through their proposed system he was telling the engineers what he wanted the computer to do. At one point, one of the engineers, interrupted to say, "Pardon me, but what is an invoice?" A few moments later a second interruption occurred and one of the engineers asked, "What does P. and L. stand for?" To this executive, a man with extensive accounting background, these questions were, of course, amusing, but very startling. The same executive told the Conference

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<sup>16</sup>Electronic Data Processing for Retailers, op. cit.,  
p. 5-2.

that the engineers were equally as amused when he asked them what a pulse generator was.

The above episode is not to suggest that this state of affairs exists to the same extent today, but it simply serves to indicate the crux of the problem of communications when people of dissimilar backgrounds are brought together.

A local firm interviewed, not one of the four department stores cited earlier, encountered difficulties with punch-card merchandise control system, which could be traced in part to a lack of manufacturer interest in the problem. A combination of system inflexibility and inexperience of the manufacturer in such systems eventually resulted in a cancellation of that part of their data-processing program.

The computer companies, for their part, exist in an intensely competitive growth industry which requires high standards of service in order to be successful. All companies market excellent equipment which is typically sold by a well-drilled and knowledgeable sales team. One large computer company, for example, send those representatives who have contact with the retail field to an intensive retail merchandising course at New York University. However, the manufacturers would probably agree that they still have much to learn about retail merchandising and the past few years have shown them taking an

increasing interest in retailing.

Retailing personnel, unlike the predominantly technically oriented people employed by computer manufacturers and large industrial concerns which have used EDP equipment successfully, may possess sound accounting backgrounds while having little training in the technical aspects of data processing. This situation has improved considerably as many business courses taught at the university level or the business college level, now include some material on EDP methods. The gap of understanding which served in earlier years to hamper the introduction of EDP to retailing is now being closed. This will have an increasingly noticeable effect in terms of EDP applications to retailing in the future.

## CHAPTER V

### THE APPLICATION OF ELECTRONIC DATA PROCESSING TO RETAIL FASHION MERCHANDISING

#### I. RETAIL MERCHANDISING

##### Merchandising Policies

Retailing, similar to most businesses, needs policies which can be used as a guide to action every time a given type of situation is encountered. One of the most important duties of the general merchandise manager is to establish and maintain a consistent merchandising policy for all departments in the store with respect to the buying, selling, and handling of merchandise. Merchandising policies are, therefore, to be regarded as standardized procedures which are adopted by a store in its activities pertaining to the merchandising function.

Before considering examples of some typical merchandising policies, the nature of the term merchandising, briefly explained in Chapter III, should be expanded on. Merchandising can be interpreted very narrowly or can be defined as a rather nebulous and all-inclusive term. Broadly defined by the American Marketing Association, merchandising is "the planning involved in marketing the right merchandise, at the right place, at the right time,

in the right quantities, and at the right price."<sup>1</sup> The five "rights" of the definition are in reference to the satisfaction of consumer preferences. Whatever is right for the consuming public, subject to reasonable limitations, is right for the retailer.

Somewhat more explicitly and recognizing that the merchandising division as it exists in most stores does not control all of the assisting functions covered by the previous definition, Wingate and Brisco state:

Merchandising has to do with all the functions having to do with bringing the goods to the point of sale, adjusting the stock investment according to the kinds of goods, styles, quantities, and prices so as to satisfy consumer demand and make a profit.<sup>2</sup>

Most merchandising policies, seldom appear in practice to be committed to paper. Instead, through close contact of merchandising personnel, the policies become assimilated and perpetuated in the everyday thinking of these people. Rather than thinking of merchandising policies as being specified by management, it would be more accurate to consider them a product of an evolution in thinking.

Examples of merchandising policies followed implicitly and explicitly by retail stores can be found in

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<sup>1</sup>American Marketing Association, Committee on Definitions Report, Journal of Marketing, 13:211, October, 1948.

<sup>2</sup>J. W. Wingate and N. A. Brisco, Buying For Retail Stores, Rev. ed. (New York : Prentice - Inc., 1949), p. 137.

numerous books on retailing.<sup>3</sup> These policies apply to such matters as the type of patronage desired, the diversification and style characteristics of the merchandise, the quality and value offered in the merchandise, the sale of irregular and seconds merchandise, the location of responsibility for controlling merchandise investment, the reaction to competitive situations, and the treatment of slow selling merchandise.

### Merchandise Classification

As previously noted, the predominant characteristic of department stores, is the existence of departments which generally contain related types of merchandise. Departmentalizing, if properly done, assures better management promotion, and control of the various merchandise lines. Several bases are commonly used for determining departmental merchandise groupings and often the merchandise items in a department are determined through the application of more than one basis.<sup>4</sup> The most common basis is the generic grouping whereby one good and perhaps some closely related items are incorporated into the same

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<sup>3</sup>National Retail Dry Goods Association, Merchandising Division, The Buyers' Manual, Rev. ed. (New York : NRDGA, 1957), p. 32; W. R. Davidson and P. L. Brown, Retailing Management, 2nd Ed. (New York : Ronald Press, 1960), p. 318.

<sup>4</sup>W. R. Davidson and P. L. Brown, op. cit., p. 115.



department. A shoe department which also sells polish and laces would be an example of such a grouping. Other bases for departmental groupings are the customer's motive in purchasing, the type of storage or display equipment required, the appeal to specific customer groups as differentiated by sex, age, income, and the adherence to customary trade practice in departmentalizing operations.

Within major departmental groupings merchandise classifications are established. A classification is defined as a subdivision for which separate merchandising records are kept but to which expenses are not charged. As in departmentalization, merchandise classification is an important means to improved control through the balancing of stocks to sales for different classifications, promotion of classifications of goods which are in particular demand, and control of inventory shortages and mark-downs.<sup>5</sup> Classification divisions generally follow descriptive or type divisions. For example, in fashion merchandising, which later will be the object of more particular interest, a small store may have a dress department with classifications for women's dresses, misses' dresses, junior dresses, and classics and formals (i.e. all sizes). In a larger store these classifications may become departments with perhaps the women's dress depart-

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<sup>5</sup>J. W. Wingate and E. O. Scholler, Techniques of Retail Merchandising, 2nd ed. (Englewood Cliffs, N.J. : Prentice-Hall, 1956), p. 330.

classified into women's better dresses and women's inexpensive dresses.

Before describing some further groupings within classification divisions, it should be emphasized that merchandise groupings are to a large extent arbitrary. All department stores have some structure of merchandise classification to facilitate store operation, but the particular merchandise breakdown must ultimately be tailored to store needs.

Price lining is usually used by department stores for pricing shopping goods--goods which the customer inspects for assortment of styles, patterns, colour, fabric and price before selection. Most ladies' fashion goods are considered shopping goods. Price lining involves substituting a single retail price for a variety of prices within a narrow range and is based on the belief that customers are grouped into rather narrow purchasing power zones. The customer is believed better able to make a selection from an assortment of merchandise without being distracted by inconsequential differences in price. Except in a few very large stores with several departments for the same type of merchandise, it frequently is not possible to provide broad assortments at many different price points and still realize a profit. This is a definite limitation that the buyer must face.

As a final note on classification of merchandise, in

the fashion jargon a "style" refers to a garment of a particular design which is assigned a "style number" by a manufacturer or vendor for purposes of cataloging his merchandise. When reference is made to styles in this thesis, it will be in the above sense. A style number may also describe a particular fabric or colour, but more frequently colours, fabrics, and sizes are described by supporting codes.

### Basic Buying and Selling Problems

The object of retail management is to achieve an acceptable return on their investment, the investment in inventory being a sizeable portion of the total investment. The potential loss of much of the retailers investment in inventory due to obsolescence of large amounts of stocks is a continuing problem. Such a situation can result from a lack of interest by the buying public, the maintenance of an inventory unbalanced in sizes, prices, etc., or having more stock than the public demands.

The relatively short average life of assets in the form of merchandise requires that the retailer concentrate on merchandise turnover as well as profit margins in order to achieve a suitable return on investment. Good purchasing decisions by the buyer provides the fundamental support for the return on investment goal. Through such decisions not only can the buyer eliminate investing in obsolete, slow-moving stock, but he could, on the other

hand, invest this capital in readily saleable merchandise which can quickly return its capital investment to be used again. The responsibility placed on the buyer or department manager for realizing a contribution margin acceptable to management, dictates that the buyer formulate merchandise buying and selling plans and that he frequently update his plans. The buyer's ability to plan, supported by economical merchandising decisions, determines whether the season's operations will be a success or not.

The buyer, in order to operate his department properly must determine the answers to a number of pertinent questions. Before the start of a particular season he asks: How many units can the department move this season? How many style numbers are needed to support sales? What initial order quantity per style is best? What is the proper colour and size distribution? Once the season is under way the buyer may ask: Which styles should be reordered? Which styles should have the prices marked down in order to sell? When and how much should the styles be marked down? As the season progresses, the buyer asks: Are the sales objectives being achieved? Are the popular styles, sizes, and colours being bought?

The need to answer these questions on a continuing basis has led all progressive retailers to adopt planning and control procedures for the merchandising and expense aspects of operation. Net profit does not just

happen but, rather, it is the result of a carefully prepared plan of action and continuous control of operations.

### Merchandise Planning and Control

The formal planning of future operations in department stores takes two forms: Merchandise planning and expense planning. Merchandise planning procedures consist of planning for those factors which enter into gross margin. More specifically, these components are sales, stocks, purchases, markups, and markdowns. Expense planning, as the name indicates, is planning which breaks down and projects the various expenses necessary in store operation. A combination of the two statements yields the budgeted net profit figure. The merchandise planning and control procedure will be developed later, in more detail. In this section the intention is to provide a background of the rationale underlying the merchandise planning and control process.

Planning and control is, of necessity, a coordinated effort because obviously without explicit specification of goals through the formulation of plans, no criteria exist as a basis for control. In addition, the dual nature of merchandise, as something having physical characteristics, while at the same time being regarded by the statistical office in a store as simply a price aggregate, is of varying relative importance to

merchandise planners. The controller who is responsible for regulating financial investment and comparing budgeted objectives and actual results of the merchandising division, is primarily concerned with the description of goods in terms of price aggregates. On the other hand, the department manager, who operates within a fairly well defined financial framework, concentrates for the most part on the physical characteristics of merchandise sold, or in stock. The general merchandising manager and divisional managers, in fulfilling their traditional role of coordinating merchandising activities plan and control operations with a more balanced point of view taken in reconciling the financial and physical aspects of merchandising.

The types of planning and control corresponding to the dual nature of merchandise mentioned above, are "dollar" and "unit" planning and control. The financial plans provide the necessary "top down" dollar guide lines which serve as a basis for total organization planning by upper management. These plans coupled with such considerations as merchandise policies, economic trends, expansion plans, operational changes, new products and services, competitive conditions, and so on, provide the foundation for gross margin depth planning. Consideration of all these factors will ensure that the aggregate depth plan is compatible with the financial goals and resources of the

organization.

The merchandise budgeting procedure for the yearly period consists of two six-month or twenty-six week periods. The budgets corresponding to these two seasons, the spring and fall seasons, start in the first week of February and the first week in August, respectively. Financial sales and stockturn projections are developed several months in advance of the season opening. This is done by the control division for the previously mentioned purpose of providing a general framework for , further development of the detailed merchandising plan. In setting these projections the participation of the merchandising division is generally limited to the higher levels of merchandising management (i.e. from the divisional manager and up). The buyer generally does not participate on a formal basis.

With the help of the merchandise manager and divisional managers, the "bottom up" merchandising plan, guided by the financial plan, accomplish a merging of unit and dollar information. This planning is done in sufficient depth to focus upon the profit potential of particular merchandise classifications permitting realistic planning of sales volume, stock requirements, and buying requirements. At the departmental level, planning starts with the development of a forecast of unit sales by week, and by price line for the coming season.

Based on this forecast, a purchasing schedule is laid out and the amount of capital, or open-to-buy, needed to support the planned operation is determined. The buyer then estimates the number of styles that will be required to support sales, places initial orders for these styles in accordance with a size and colour distribution, and specifies an estimated delivery date for each order.

If discrepancies exist between the "bottom up" plan and the "top down", or over-all financial plan, an appropriate reconciliation must be made. Once a meeting of the minds has been achieved, the resultant dollar merchandise plan is used by the statistical office in the control division to check actual performance. This general budgeting procedure is similar for most department store merchandise departments although the terminology, in line with the concentration of this chapter on fashion merchandising, is somewhat more applicable in that area.

Once selling has started, each style on the floor is periodically evaluated and a decision should be made to reorder, continue operations as planned, or increase the movement of merchandise by increasing sales effort or taking markdowns. This is the control aspect of merchandising, exercised after comparing plans with the actual sales performance. It is important to note that the selection and timing of styles are areas where the buyer's professional abilities can still be the best guide. The



possibility of automating reorder decisions in fashions, such as is now being attempted in staple merchandise with the use of economic reorder models, seems a rather remote possibility.<sup>6</sup>

To summarize this discussion, the completed merchandise plan provides the means by which the retailer can check his actual results with the planned figures analogous to the control procedure represented by the block diagram in Chapter II. Before the store makes sales it must purchase merchandise which, in turn, requires an outlay of money. In addition, the purchases must be marked up to cover operating expenses, the desired net profit, and the probable reductions (i.e. markdowns, discounts, shortages). The merchandise plan coordinates all these activities indicating to the retailer the amount of money needed to finance the purchases and giving him some idea of the revenue he can expect from sales. In a department store handling a number of different lines, the periods of heavy investment are not the same in all lines or classes of goods. The over-all merchandise budget shows the capital needs for inventory in the store as a whole, month by month during the season. This information enables the finance and control division to see the capital shifts from department to department during the year, while at

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<sup>6</sup>J. Buchan and E. Koeningsberg, Scientific Inventory Management (Englewood Cliffs, N.J. : Prentice-Hall, 1963), p. 45.

the same time allowing them to gauge more accurately the needed working capital and so to speed up the rate of capital turnover.

### The Detailed Merchandise Budget

The emphasis in this discussion of detailed merchandise budgeting will be on the systematic consideration of the components of the plan. The merchandise budget provides the guide lines for gross margin performance by assembling data on sales stocks, retail reductions, mark-ups, and purchase in that order.<sup>7</sup> Depending on whether the plan is in the final form or not, the figures for these components may be subject to arbitration. However, in this section our interest is in determining the method in which the data are derived.

Sales planning. The cornerstone of the entire merchandise budget is the volume of sales that can be expected for the period under consideration, because other planned figures are dependent on the expected sales or revenue. Estimates are made for individual departments and these figures are broken down by months and weeks within the budget period. In the fashion departments, sales projections are generally made for each classification - price line group. For example, the \$19.95 price line in ladies' skirts would be projected as a single figure.

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<sup>7</sup>W. R. Davidson and P. L. Brown, op. cit., p. 281.

The best basis for making these projections, as is true of any type of forecasting, is to combine the available knowledge of history with the knowledge of present and future conditions which affect the sales figures. Information derived from retailing periodicals, population statistics, economic surveys, and the like, can be important guides to a more scientific approach to sales analysis. Ultimately, the sales figure represents a well educated guess. In department stores, barring unusual circumstances, traditionally the sales figure of the comparable period of the previous year is the figure which must be surpassed.

A situation cited by one merchandising man gives some indication of the difficulties involved in making sales projections when conflicting factors are at work. This organization could see the impact in their British Columbia sales triggered by a steady growth in the teenage population since the war and rising per capita incomes. The population factor tended to increase sales of budget priced merchandise which was counterbalanced by a "buying up" trend or buying of a better quality of merchandise precipitated by the rising incomes. The net effect was reflected in classification - price line figures by an expanding sales volume which over the years had steadily shifted upward in price line. Unfortunately, although income and population figures were used in forecasting, the effect was too erratic to lend itself to good

prediction.

Stock planning. Once the sales volume has been forecast the next step of the merchandise budget is the planning involved in maintaining inventory levels adequate to meet the planned volume of sales. The determination of stock levels must necessarily represent some sort of compromise, in that enough stock must be provided to maintain assortments required to achieve the expected sales goal while at the same time not being so large as to require the investment of an unnecessarily large amount of capital, and thereby preventing a respectable turnover.

In local fashion departments the beginning of the month inventory in each classification is generally set using historical stock-sales ratios for the comparable month and classification. These ratios are an important planning guide because they relate stock at a specific time, namely, the beginning of the month, to sales for that month. Obviously, the end of month (EOM) stock for one month is the beginning of month - (BOM) stock for the month immediately following.

The stock figures arrived at using stock-sales ratios are, of course, tempered with judgment. Experience has shown that the expansion of sales in a classification generally requires that it be supported by a less than proportional increase in the beginning of the month stock. Once the beginning of the month inventory has been

established, the responsibility falls on the department buyer for planning an adequate assortment of stock. The buyer must plan price line, style, colour, fabric, and size distributions suited to the customers he serves.

Retail reduction planning. The term "retail reductions" when used in reference to merchandise budgeting designates such anticipated reductions in revenue as markdowns, stock shortages, and discounts to employees and special classes of customers. Markdowns, which are the reductions in price a retailer takes in order to clear slow moving, soiled, or otherwise damaged merchandise, constitute the greatest percentage of this group of reductions.

Planning of retail reductions is important to the retailer for several reasons. If retail reductions are not taken into account along with other expenses when calculating the markup to be taken on goods, the result could be a markup too low with the expected net profit being lost in retail reductions. From a control standpoint, the comparison of planned and actual reduction figures provides the basis for a more intensive study of the reasons for reductions. This approach often suggests ways of eliminating or reducing their frequency. Finally, by planning markdowns, the department manager will usually take them more promptly, and as a result move the merchandise with small markdowns early in the period,

rather than taking large markdown losses at the end.

The importance of reduction planning can vary quite widely for different merchandise lines. In fashion merchandising, where these reductions are a relatively large and regularly recurring aspect of merchandise strategy, such planning is essential. Accepted practice has been to determine the total dollar reduction allowance for the budget period based on modified, historical percentage of sale figures. The total planned reductions are then distributed by months with progressively larger reductions being taken in the latter months of the budget period when large markdowns are often taken to clear the stock.

Markup planning. Calculation of what is variously known as cumulative markup, initial markup, or markon is the object of the next step of the merchandise budgeting procedure. The cumulative markup is the difference between the cost of the merchandise delivered to the retailer and the full retail value (i.e. before retail reductions) of the merchandise handled. Cumulative markup, when expressed as a percentage, is generally based on the original retail value, unlike the treatment of retail reductions, expenses, and net profit which are expressed as a percentage of actual sales. Once the planned sales net profit, retail retail reductions and expenses have been determined the

the planned cumulative markup in per cent is expressed as:<sup>8</sup>

$$\begin{aligned}
 \text{Cumulative markup \%} &= \frac{(\text{original retail value}) - (\text{merchandise cost plus shipping})}{\text{original retail value}} \\
 &= \frac{\text{expenses} + \text{profits} + \text{retail reductions}}{\text{sales} + \text{retail reductions}} \\
 &= \frac{\text{gross margin} + \text{retail reductions} + \text{alteration costs} - \text{cash discounts}}{\text{sales} + \text{retail reduction}}
 \end{aligned}$$

The difference between the cost of merchandise and the price at which it is actually sold is called the maintained markup. As a percentage, maintained markup is based on actual retail sales. It is the store which determines the cumulative markup, but, because as a group consumers only buy the merchandise after a suitable amount of retail reductions has been made available, it is often said that the consuming public determines the maintained markup. In the last analysis, the maintained markup rather than the cumulative markup determines whether the organization makes a profit.

Separate markup goals are usually worked out for each classification of merchandise, the expectation being that they will yield, on the average, a total margin sufficient to cover total operating expenses and

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<sup>8</sup>F. M. Jones, Principles of Retailing (New York : Pitman, 1949), p. 303.

provide an acceptable net profit. In fashions, because price lining is used extensively, the buyer inspects merchandise with the intention of buying for a certain price line. At this point his knowledge of fabric, style, and his customers' tastes is critical. If the merchandise is not of a sufficient quality to sell at the price line necessary to earn the desired margin, entire lots of merchandise may eventually have to be marked down. As the season progresses department managers usually check the planned and actual maintained markups to determine whether or not the markup on the remainder of the season's purchases has to be revised.

Purchase planning. Whereas the estimation of sales, the determination of stock levels, the planning of retail reductions, and the planning of markup requires considerable judgment, the purchasing planning step follows directly from the preceding budget stages. The purpose of purchase planning is to assist the buyer in making the purchases at the proper time and in the correct amounts so that the stocks of merchandise will be kept at the desired level in relation to sales. The monthly planned purchases are calculated as follows:<sup>9</sup>

$$\text{planned purchases (retail value)} = (\text{planned sales}) + (\text{planned reductions}) + (\text{planned EOM stock}) - (\text{planned BOM stock})$$

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<sup>9</sup>W. R. Davidson and P. L. Brown, Retailing Management, 2nd ed. (New York : Ronald Press, 1960), p. 294.



The above formula gives the planned purchases, at retail value, of the merchandise that can be brought into stock during the period specified. The planned purchases at cost (i.e. the amount of money the buyer can spend) can be calculated by reducing the retail figure by the cost complement of the planned initial markup percentage. The orders for this merchandise are placed to allow a suitable lead time, this lead time depending on such factors as the location of suppliers, the ability of vendors to make prompt delivery, and the type of transportation used. Therefore, the orders for the beginning of the spring season in February may actually be placed in perhaps December, in order that they arrive in time.

The control aspect of this purchase plan is exercised by regularly updated dollar control or open-to-buy control reports. Open-to-buy refers to the amount of merchandise that the buyer may order for delivery during the balance of any period. At the beginning of the period the open to buy is the amount by which the planned purchases exceed the outstanding orders, including merchandise in transit. With reference to the above planned purchase formula, obviously the deviations from planned sales and reductions will be reflected in the open-to-buy balance. If actual sales are lagging appreciably behind planned sales and if a good portion of the current-month purchase orders based on the planned purchase schedule

have been confirmed, the department manager can very easily find himself in an overbought position.

To aid the buyer the open-to-buy figure at retail can be reduced to cost as before, by multiplying it by the complement of the planned markup. The buyer generally uses a large part of this allotted buying allowance early in the month, although some must be saved for ordering fill-in merchandise to keep stocks complete. The task of confirming merchandise orders falls on the divisional merchandise manager's shoulders and in this way he controls buyer purchases so that the purchase allowance is not exceeded. Most merchandise men were quick to point out that the limits are not rigid. If it were possible for a buyer to obtain an exceptionally good bargain on an order of merchandise, his case could be routed up through the divisional manager and general merchandise manager for approval by the controller.

The preceding section, in total, constitutes the elements of the merchandise planning procedure. Merchandise control results from effective use by the retailer of the data available through the completed plan. Naturally, the plan is of greatest use when the data itself is arrived at only after considerable thought and care. As such, it can be an invaluable tool in merchandise management.

## II. FASHION MERCHANDISING

### Characteristics of Fashion Merchandising

The fashion merchandisers interviewed firmly believe that their line of work is the most interesting and challenging of any in the department store field. If variety and uncertainty are any criteria, certainly the enthusiasm of these people is well founded. As the name implies, the outstanding characteristic of this type of merchandising is fashion. In the terminology of the retailing field, fashion merchandising refers to ladies' clothing fashions although certainly many goods carried in a department store, from men's clothing to vacuum cleaners, have some element of fashion. A fashion is a style that is popular at any given time. While fashions may change, styles are permanent and continue to exist long after they have become unpopular or have gone out of fashion. The permanent character of a style gives rise to what is known as the fashion cycle. That is, the gradual increase in acceptance of a given style until a peak of popularity is reached, and then a decline in popularity until sales or use have fallen to a minimum. The movement of a style through its fashion cycle is a problem of no small concern to retailers and poses some very difficult questions.

The fashion merchandising field is undoubtedly the most volatile and unpredictable of any in the department

store. Because of the nature of the fashion cycle these stocks are in the greatest danger of rapidly becoming obsolete. There is a certain short period of time in which the public finds the merchandise fresh and desirable, and will buy it in certain quantities at normal markup prices. Prior to that period the consumers are unlikely to buy the merchandise at all and subsequent to that period they may buy it but will expect to get it at marked down prices. Consistent with merchandise policies which indicate the income groups that the department is aiming at and policies regarding the timing of new styles, the buyer must estimate the length of time from the creation of a new style to its eventual decline and must purchase merchandise for sale to its customers during a particular segment of the fashion cycle.

Fashions are highly influenced by factors which can be highly variable and unpredictable. A typical example from the 1963 and 1964 spring seasons is the adverse effect the cool and damp weather has had on the sale of summer ready-to-wear garments in the Vancouver area. Another factor is the inability to predict consumer reaction to new styles which, in turn, makes any estimate of demand very difficult. To ease the amount of uncertainty surrounding these projections, local stores often test consumer reaction in advance by marketing test samples perhaps a month before the beginning of the spring and

fall seasons. Because of the high degree of risk inherent in fashion merchandising, initial markups almost universally are fifty per cent and up, while markdowns on sale merchandise can result in reductions to cost or less.

Reordering of fashion merchandise also presents the buyer with unique problems. Bearing in mind that before cloth can be fashioned by the manufacturer into finished garments, the cloth must be woven and dyes must be available for dying it, the result is that a large volume of reorders can lead to a merchandise backup that extends through the vendor to a bottleneck at the raw materials source. In addition, because most manufacturers and vendors are located in the eastern regions of the country, transportation also becomes a factor for West Coast retailers. This transit problem, coupled with the previous raw materials problem, creates a situation for West Coast retailers which places a premium on accurate and fast merchandising information. Quick action in reordering can secure scarce merchandise which later may not be available and at the same time lessens the chance that the fashion will have passed its peak by the time the merchandise has arrived. The buyer in Vancouver today, more than ever before, needs an efficient unit control system to keep him abreast with the merchandising situation.

#### Components of a Suitable Fashion Merchandise Control System

Fashion unit control is primarily a measurement

function performed with the expectation that the end result will be improved merchandising decisions. The purpose of the knowledge gained from the accumulation of statistical data concerning merchandise movement is to provide for a more satisfactory flow of merchandise within the framework of existing market conditions and the established company policies regarding dollar inventories. As mentioned in Chapter II, the EDP system, as applied to fashion unit control, serves as a measurement tool to monitor, more quickly and efficiently, the paper flow generated as a by-product of the physical business operation.<sup>10</sup> The degree and periodicity of adequate control is a function of the nature of the merchandise being controlled and of the capacity of the merchandising staff to utilize the resulting data. The functioning of unit control is also subject to the organizational limitations which exist in the store.

From the retailing management point of view, the merchandise control system should help to accomplish the dual objectives of improved inventory turnover and increased profits necessary to meet return-on-investment goals. Fashions in particular are plagued with a selling situation in which large markdowns are often necessary

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<sup>10</sup> Supra, Chap. II, p. 49.

to clear stocks while cutting heavily into profits. In the Vancouver area department stores regularly experience in fashions average markdown percentages of seven to twelve per cent over the season. It should be noted that this percentage is significant compared with the expense figures earlier mentioned in connection with the performance of regular accounting tasks such as accounts receivables, accounts payable, etc.<sup>11</sup> For this reason, fashion merchandising is believed to be an area of retailing that could reap great potential benefit from the installation of EDP methods.

Interviews which the writer had with fashion merchandising people revealed quite clearly that their job is partly an art and partly a science. Much of the buying and selling function is based on the value judgments so characteristic of the use of the human faculties and as a result the complete automation of the decisions associated with the buying and selling functions of retailing seem rather improbable. Certainly a good part of human rationality can be injected into the mechanized treatment of these problems, through the medium of the computer program. But the question remains whether the cost, time, and inflexibility of programs written for problems which in certain ways are never quite identical, do not put such automated methods out of reach at the present time. It

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<sup>11</sup>Supra, Chap. IV, p. 107.

would seem that considerable improvement of computer hardware and programming methods would have to be undertaken before such analysis were possible. Therefore, the conclusion one reaches is that, at present, the most important role that EDP equipment can fulfill is to provide information for merchandising personnel. This function is the primary objective of a good unit merchandise control system.

In order to aid the merchandising people in performing their duties, an EDP unit control system should be so designed that the essential information is available to the right people, organized in a meaningful way, while at the same time providing a comprehensive, up-to-date review of the merchandising situation without imposing too severe a drain on their valuable time. Previously, some of the questions which retailing personnel ask in the course of conducting their merchandising duties were outlined and serve as a guide to the type of information that they require.<sup>12</sup> Later reference is made to the importance of relating the information contained in management reports to the administrative responsibilities of the person receiving the information.<sup>13</sup> Consequently,

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<sup>12</sup>Supra, Chap. V, p.126.

<sup>13</sup>Infra, Chap. V, p. 153.



the discussion of examples of merchandise control reports points out the personnel that would be interested in these reports, bearing in mind the responsibility vested at different levels in retail management of department stores.<sup>14</sup>

It is generally accepted that exception reporting is the best method of achieving widespread control over business operations. This is especially true in retailing for two main reasons. In the local retailing setting where a divisional manager may have twenty or thirty departments under his control and where a department manager has vested in him the responsibility for supervising the sale, ordering, and re-ordering of vast quantities of stock, the shortage of managerial time makes exception reporting a virtual necessity for efficient operation.

Secondly, the capabilities of modern electronic equipment, when adapted to conventional unit control systems, has resulted in the production of vast quantities of reports and records. If proper care is not taken buyers can be supplied with a great volume of facts and figures which is beyond their ability to use effectively. This lack of selectivity caused a local ladies' wear chain to discontinue the use of its punched-card merchandise control system. The real potential for improvement in

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<sup>14</sup>Infra, Chap. V, p. 161.

merchandise control systems is in the design of systems which supply the information quickly, provide reports with information which previously may not have been practically available, and providing reports reduced to manageable proportions. A problem to be tackled in creating such reports in the dynamic fashion field is the development of suitable criteria by which the reports may be generated. Some thoughts on this subject will be presented in a later section.

Later in this chapter, the results of the preceding discussion, which has touched on the components of a suitable merchandise control system, are expressed in the form of merchandise control reports. These reports, as well as the buyer's personal contact with the merchandise and the sales people, aid the buyer in maintaining a balanced stock that is desirable to the customer. This type of merchandise control, no matter how sophisticated, is never a substitute for the buyer. The control reports are only a tool for the buyer and control exists only when information is interpreted and translated into action. Intelligently used, the information provided can be of considerable value in improving buying practices. As stated by Mr. H. A. Leeds:

While it is axiomatic that retailing is an inexact science with inherent risk capacity, the intent of improved informational media is not to discourage the risk element. Rather it is to ensure greater

calculation while minimizing speculation and, in the process, to encourage greater chance taking with greater conviction.<sup>15</sup>

The final test of the information derived from the control system, the accuracy of merchandise and expense budgets, the competence of retailing management, and the ability of the buyer, is reflected in dollar sales.

#### Unit Control Systems of Local Retail Stores

The local retail establishments visited made extensive use of Dennison or Kimball price tickets of the pin or string type in their fashion departments. These price tickets may have coded on them such relevant data as the classification (i.e. ladies' coats, ladies' suits, ladies' better dresses, etc.), the week the garment was placed on the sales floor, the vendor, the size, the style, the colour, the fabric, and the price. Generally, the coded information was not as extensive as the possible sub-divisions listed above.

The tags are either two or three-part tags. The stores using two-part tickets remove one part at the time of sale, dropping this into a box for later sorting and tabulation, while the second tag stays with the garment in the event that it is returned. The procedure with the three-part tag is identical to that of the two-part, with

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<sup>15</sup>H. A. Leeds, "What Does Inventory Management Mean," Retail Control, 34:33, October, 1963.

the exception that if the article is returned, it still has a two-part tag on it and can be promptly returned to the floor for sale. Garments with the two-part tags must be returned to the receiving and marking department for new tags before being returned to the sales floor. Frequency of returns is therefore a key consideration in the use of these tags.

This type of unit control system is, of course, of the perpetual inventory type, as opposed to the periodic physical inventory type in which periodic counts of actual stock are taken. All of the accumulated price tickets received from both the departments in the parent store, as well as the departments in the outlying branch stores are sorted and tabulated by departmental merchandise personnel of the parent store. The tickets may have the data printed and punched as well for mechanical machine processing. Detailed descriptions of the theory and use of these tickets can be found in retailing periodicals.<sup>16</sup>

In fashion merchandise departments, once the price tickets are sorted to style number, all stores post sales on a card, referred to as a style sheet, which is organized to show sales by the week for the main store

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<sup>16</sup>E. Langtry, "Standard Pre-Marking of Lingerie," Retail Control, 30:3-10, March, 1962; S. Shaffer, "Print Punch Unit Control," Retail Control, 30:71-82, October, 1961.

and branch stores during the current season. Also shown on the style sheets are the initial on-hand quantities, the later arrivals and re-orders, the initial distribution of styles amongst branch stores, and the subsequent arrivals and transfers from other branches. Each ticket representing a sale is simply posted in the proper style-store-week classification of the style sheet. The records for a closely related group of departments are usually centrally located to provide access for merchandising personnel (i.e. divisional manager, department manager or salespeople). These records may be updated by departmental salespeople or in some cases, someone may be in charge of updating the consolidated records of a number of departments deposited at the central location. The practice in fashion departments has been to update these records daily.

The major weakness of such a unit control system as an aid to the merchandising man is that the information, although summarized on style sheets, is not presented in a manner most advantageous to merchandising personnel. In addition, the data may not be tabulated until some time the following day. The buyer and divisional merchandise manager can waste valuable time in scanning these style sheets to spot slow moving merchandise and potential out-of-stock and re-order situations. The sheer mass of data may also result in his overlooking of important detail.

The lack of a systematic procedure for presenting reports also appears to be a common failing of these systems.

The procedure of report preparation which will be later proposed, places heavy emphasis on providing summarized reports based as much as possible on criteria allowing exception reporting. The reports would be prepared after the close of sales for the day, taking advantage of the speed of EDP equipment to have all pertinent merchandising information ready for review the next morning. In addition, by capitalizing on the characteristics of EDP equipment, reports can be prepared which would not be possible using manual processing methods. Periodically, weekly, monthly, and seasonal reports are included along with the daily reports. A regular reporting procedure such as this makes it possible for merchandising personnel to review the results of the preceding day's activity and encourages him to act on this information.

#### An Examination of the Lag in Application of Electronic Data Processing to Merchandising

In view of the lack of merchandising applications of EDP equipment, one is obliged to suggest some possible reasons for this inactivity. Probably the most important reason is that before an EDP merchandise control system is operable, its benefits are largely hypothetical and difficult to support in terms of a reasonable estimate of tangible cost savings. On the other hand, in spite of the

relatively low percentage of sales expense that such applications as accounts receivable and payroll represent, as cited earlier in the thesis, these applications are amenable to analysis which within reasonable doubt shows that the use of EDP methods can result in actual savings. This analysis is done on so-called "bench mark" problems which are problems typical of the data processing jobs that are performed in the business.<sup>17</sup>

The reason for the savings in converting the above "bread and butter" applications to EDP methods is partly because over the years many businesses have already standardized these applications to speed up the manual processing or processing with wired program punched-card tabulators. Consequently, these applications often are investigated first since it is felt that they could be converted with the least system design necessary.

Merchandise control has typically been a manual decentralized tabulating operation. Adapting this procedure to EDP methods is thought to involve a considerable amount of revision and redesign of existing systems in order that the reports produced are flexible and do not include superfluous data. Management reports should be built around organization plans so that deviations from plans can be traced to the individual responsible. To plan such

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<sup>17</sup>National Industrial Conference Board, Studies in Business Policy, No. 98, "Administration of Electronic Data Processing," p. 35.

a system, designers would require merchandising personnel to define more precisely the methods used in analysis of unit control reports so that the data may be classified in a manner that is most readily understood by the recipient. This planning would also require better definition of authority and responsibility within the merchandising organization to ensure that only information pertinent to the person receiving the report is shown. Basic problems such as these, unless resolved, contribute to the difficulty of systems design.

Concurrent with the redesign problem is the problem of training and re-education of merchandise personnel to use the new system properly and to contribute to its continued successful operation. Many merchandising personnel may have started in their chosen field long before the advent of EDP equipment. They may have a background of reasonably good success with current inadequate systems. Though a re-education program could meet with opposition from those who resent changes, it should be mentioned that the local fashion merchandisers interviewed were on the whole, quite receptive to the potential offered by improved merchandise control systems.

The concentration on the more traditional accounting applications may also be attributed to the fact that feasibility studies, systems design, and operation of the installation itself, are usually placed under the



supervision of the controller. Quite possibly, the accounting oriented point of view of the controller has biased the uses to which the EDP equipment is put. Once merchandising management has been convinced that EDP methods contribute to better merchandising, the responsibility rests with them to become more vocal in gaining time on the equipment for merchandising applications. However, the impetus for this must come from within the merchandising division; this requires that these people gain insight into operation of the equipment and subsequently formulate some definite ideas as to the best methods of report preparation so that a strong case can be presented to the controller.

### III. PREPARATION AND CONTENT OF UNIT CONTROL REPORTS FOR FASHION MERCHANDISING BY ELECTRONIC DATA PROCESSING METHODS

#### Procedural Problems

The merchandise control tape. The most advanced merchandise control systems which are now in operation maintain fashion merchandise by recording it on magnetic tape.<sup>18</sup> Each record of the merchandise control tape

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<sup>18</sup>International Business Machines, Technical Publications Report, "General Information Manual; IBM 1401, Tape System for Accounts Receivable and Merchandise Management of Maison Blanche (White Plains, N.Y. : IBM, 1962), p. 18.

refers to a particular style. Through the use of coded groups of data, called fields, a particular record is first fully identified, then movement and inventory data are given. The record is identified by fields specifying the department, the classification (class), the selling price, the manufacturer, the style, and the original selling price in that order. The records on the tape are maintained in numerical sequence of the identification codes listed.

In a parent-branch store organization of department stores such as one finds in the Vancouver area, movement data in a style record would consist of the total receipts to date, the receipts by week which is used to age the on-hand inventory, the net sales of the current month to date for each store and in total, the net sales of the previous month for each store and in total, the cumulative sales by month end for each month since the beginning of the merchandise budget period, the net sales to date by colour, the net receipts to date by colour, and the date of the last sale.

The inventory data consists of the on-hand inventory of that style for each store and in total. All of the individual records, each one carrying the above data, in total constitute the merchandise control tape. Because each style is carried on the record at a particular selling price, a markdown creates a new record.

Merchandising source data. The source data from sales can be obtained by having the data punched into point-of-sale recorders, by key-punching sales data entered on merchandise listing sheets and sales checks, or by using the Dennison or Kimball print-punch stubs. In any case, by using a variety of conversion devices the sales data can be converted to a form which is compatible with the input requirements, of the EDP system. It shall be assumed here that the conventional print-punch price tickets are converted to punched cards using ticket-to-card converters that are currently available.<sup>19</sup> Tickets which are mutilated or which require special information to be added (i.e. marked down prices) may be manually key-punched in their entirety, or in part.

Customer returns data are prepared by punching a card for each item from either a stub of the returned price ticket or, where no stub is available, from the data written on the credit or refund check.

The data processing department should receive a copy of receiving reports in order that cards can be punched for merchandise receipts. The receiving report is prepared after a reconciliation is made between the original purchase order and the vendor's or manufacturer's invoice. One or more cards may be punched for each style received. Only

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<sup>19</sup>H. V. Oldenburg, "Is Electronics Practical for Retailers?" Retail Control, 27:126, September, 1958.

one card is punched if there is no colour control but if an item is also controlled by colour as was indicated in the record classification system outlined, a card is punched for each style-colour classification.

The cards for returns to vendors are punched from the documents which debit the vendor's account.

All receipts are initially charged to the main store. When merchandise is shipped to the branches, a distribution sheet is forwarded to the data processing department to serve as the source for punching the transfer cards. One card is punched for each style transferred to each store.

Inventory adjustment cards are used to adjust the balances as indicated by sheets prepared at inventory taking time and from inventory adjustment memos at other times during the year. In this way, any errors or shortages are detected and allowance made for them.

When garments are marked down, price change cards are punched from markdown sheets. This permits a new style record to be created on the master control tape and the old style record changed to reflect the quantities marked down.

Updating of the merchandise control tape. The merchandise control tape is updated as often as the most frequently prepared report. Updating the tape consists of matching the appropriate part of the tape

record to the input cards and transferring sales, customer returns, receipts, returns to vendors, inter-store transfers, inventory adjustments, and price changes that have accumulated since the previous updating run. The input cards are put into a sequence corresponding to the tape record; they are updated against the existing merchandise control tape, and a new tape is produced. Ignoring the details of input-output control, the logic of the program for such an updating run would be quite simple, (i.e. a matter of locating the tape record and adding or subtracting the appropriate fields on the card and tape). Using the updated tape, programs could then be written to produce the various reports useful to the merchandising division.

#### Establishing Exception Criteria

Two of the merchandise control reports that will be discussed, namely the Best Seller Report and the Slow Seller Report, are based on exception criteria. These are reports which could be produced daily and, remembering the discussion of buying problems in fashions, obviously they contain information critical to the buyer. Before the reports can be produced, one must consider the approach to be taken in developing suitable criteria.

To cite some experience gained from limited applications so far, one department store in the United States has used, with some success, a system based on percentage

of sales limits.<sup>20</sup> After the merchandise tape has been through the daily updating run, the style records are tested to determine if any style has sold 10 per cent of its total stock in a day and/or 20 per cent in a week, and/or 30 per cent in two weeks. If so, it has the potential for re-order, subject to the buyer's discretion, and would therefore be listed on a best-selling sheet.

It would be equally reasonable to establish percentage of sales limits to determine slow selling styles. The author of the article stressed that the criteria used are by no means absolute. Rather, they are criteria which are established based on experience and are revised and improved through experience. No hard and fast rules exist but the apparent success the organization involved had, demonstrates that such a system is feasible.

A "death rate" system is another method which could conceivably be adapted to EDP.<sup>21</sup> By this system a time deadline is set and coded into the price ticket when the merchandise arrives, this deadline representing the maximum time allowed before some action is considered. Once the merchandise has reached the death date, this is brought to the buyer's attention by a report and it is then considered

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<sup>20</sup>C. R. McBrier, "Progress Report on Electronic Data Processing," Stores, 42:63, May, 1960.

<sup>21</sup>W. Burston, "A Death Rate System to Force Markdowns and Speed Turnover," Stores, 41:17, November, 1959.

for potential markdown.

Despite the system used it seems clear that special care must be taken to operate the merchandise reporting system in such a way as to provide for contact between personnel of the data processing department and the merchandising division. This contact is necessary for determining changing report requirements and revision of exception criteria. This question deserves special consideration and will be discussed further in a later section.

#### Unit Control Reports for Fashion Merchandising

The best-seller report. Best-seller reports could be produced daily based on a breakdown of styles by fashion departments with different reports prepared for each department manager. A series of such departmental reports should be given to the divisional fashion merchandise manager.

The report could contain data for each style that qualifies after being compared with the exception criterion. Some data which could be shown are the total sales, total on-hand inventory breakdown by stores, the percentages of total stock sold in the previous day, week and two-week period (i.e. if the style has been on the sales floor that long) compared with the percentages set by the exception criteria, total receipts and sales by colour, if the style is controlled by colour.

Combined with the buyer's knowledge of the merchandise situation, this report could be extremely valuable for showing those styles which must be reordered, show potential for reorder, or already are reordered but must be rushed to avoid an out-of-stock condition. The information could also indicate a poor distribution amongst stores which, if not remedied, may result in a loss of sales through stock outs.

The slow-seller report. The information content and distribution for this report should be very similar to that of the best-seller report. This report is used to protect profit and prevent unnecessary markdowns by taking action regarding promotion, sales emphasis, and small markdowns before the style becomes a serious problem. The possibility also exists that open orders may be cancelled and merchandise returned to the vendor if action is taken quickly enough. The divisional merchandise manager whose role is largely one of a trouble shooter and coordinator would be particularly interested in this report.

The class price line report. This report breaks down unit sales and on-hand inventory by price line within merchandise classifications. This report is an extremely important indicator to the general merchandise manager, the divisional manager, and the buyer, of the success they



are having in adhering to their merchandising policies. Expanding volume in high price lines in a department intending to cater to a middle-price line clientele would certainly call for some revision of the merchandise budget procedure. In addition to determining the merchandise classifications that are selling, the report is useful in deciding which classification price lines to promote and determining whether any steps are necessary to balance the stock in a particular department.

This report is prepared monthly to allow time for significant trends to develop. It lists in ascending price sequence sales and on-hand figures in total and by store for all styles within a classification. Also listed with the identifying information of price line and style number are the departments in which the style is sold, the manufacturer and the original price.

The aging report. The aging report is prepared monthly to help further assist the buyer and divisional managers to locate old and potentially troublesome merchandise so that appropriate action can be taken. All styles are listed with the identifying codes for the department, the classification, the manufacturer, the present price and the original price. For each style the total quantity received to date is given along with the sales by month, the total on-hand inventory, and an aging distribution for the on-hand inventory (i.e. number of items over two weeks old, number of items over one month old, etc.).

The sections of the updated style records on the merchandise control tape which contains the aged receipts of the style by week and the cumulative sales by months for the style are of particular relevance for preparing the monthly aging report. All receipts are entered by week on the control tape by the receipt cards during an updating run. Sales cards, prepared from price tags containing a code for the date the particular piece of merchandise was received, are used to subtract one unit from the appropriate received-by-week field on the tape. The received-by-week part of the style record after updating therefore represents the aged on-hand inventory.

This report gives those concerned more insight into the operations of a department in helping them to spot merchandise which may be obsolete, soiled, and suitable for markdown. The aging report supplements the slow moving report and in the event that the older stock is to be consolidated for a clear-out sale, the report points to that stock to be considered.

The manufacturer's report. The purpose of this report, prepared at the end of each merchandise budgeting period, is to provide a résumé by selling department of the amount each manufacturer's merchandise actually sold for, the original retail value of the merchandise sold, and the difference between the two (i.e. the net markdown).

This report is a useful one for showing the over-all

of the different manufacturers, thus serving as a guide to the department and divisional managers in their future buying commitments. Manufacturers who have poor markdown records should be replaced by others with more popular and profitable lines.

#### Organizing for Merchandising-Data Processing Liaison

If an organization were to embark on a program to incorporate merchandise control reporting into its EDP system the author firmly believes that serious consideration should be given to setting up a merchandising-data processing liaison group. The fashion merchandising field is a particularly dynamic segment of department store retailing and as the reports above indicate, the reporting procedures that are set up to provide specific types of information are usually established to meet a given set of circumstances.

The timing of reports, for example, will vary considerably. Because the success or failure of a merchandising season is to a large extent determined in the first three to six weeks of the season, daily best-seller and slow-seller reports may be vitally important to the buyer during this period. In the declining weeks of the period they are of little use and may only be issued weekly or bi-monthly.

The exception criteria on which these reports are based are a product of the circumstances and may have to

be revised during the course of the season. This is not a very significant technical problem as the program used to prepare the report can easily be written so that new exception limits must be inserted with the data cards each time the program is run. What could be an important problem, especially in the initial stages of conversion to fashion merchandise control, is the lack of management foresight in assigning the proper type of person to cope with the varying needs of merchandise management and consult with these people on a regular basis. It is absolutely essential that systems in use be reviewed frequently to determine their suitability in the light of new conditions. It is equally important that one consider the qualifications of the person or persons needed for the job.

The liaison function would be performed between the data center personnel, who presumably would be under the supervision of the controller, and the merchandising division personnel. The person or persons undertaking the job should have a combination of merchandising knowledge, knowledge of administration and administrative responsibilities, and technical experience in programming.

A good grasp of merchandising fundamentals is obviously a necessity for such a position to facilitate communication between two factions of retailing which may not talk the same technical language. Their difference in outlooks requires that someone be designated to bridge

this gap on a regular and continuing basis. The task is too important to be left to haphazard meetings whenever trouble arises and judging from the content of the reports, this could occur fairly frequently.

Technical knowledge of programming is another important prerequisite of the position. This knowledge ensures that discussions about possible merchandising applications are always directed keeping in mind the capabilities of the EDP equipment. This will promote a constructive approach to merchandising problems and prevent wasting the valuable time of personnel in the data center.

Lastly, the administrative responsibilities associated with merchandising must be considered. Although organization theory insists that organization structure and responsibilities must first be defined and personnel found to fit these positions, in practice retailing responsibility is to a great extent a function of the individual and a function of changing circumstances. An understanding of these administrative responsibilities and their changes is necessary in order to define what constitutes information for a particular retailing executive.

If inroads are to be made in supporting merchandise management with reports produced by EDP equipment, one should recognize that the installations must be related in a meaningful way to the people using its reports. Creating this position, which, probably would act in a staff capacity

to the EDP personnel, would give its occupants a perspective which is oriented toward exploring ways of usefully assisting the merchandising function.

## CHAPTER VI

### CONCLUSIONS

There seems to be little doubt that management today is taking part in a revolution of methods and techniques which have been prompted by some very real needs on the part of business. While the broad outlines of this revolution, as outlined in Chapter II, present a very glamorous picture of these sophisticated techniques, this picture is by no means characteristic of the situation which is faced in retailing. Retailing at present makes very little use of the ideas developed by the operations researchers.

Despite the fact that retailing involves dealing with masses of detail and that routine record keeping is a necessary part of retailing, one must not lose sight of the need to provide information to management to facilitate the performance of the planning and control function. The pressing need for shifting the emphasis in data processing from volume record keeping to the development of management information for planning and control has been underscored in an article by Gerald L. Phillippe, controller of the General Electric Company who commented as follows:

There is a frightening common desire today to prove that incredible amounts of information can be developed with electronic devices by preparing reports that are incredibly long, incredibly dull, and all in all, just plain incredible . . . . Information alone is not

enough . . . . What is needed obviously is a planned system of business intelligence . . . a "management information" system which selects, rejects, edits, and headlines business information--<sup>1</sup> in short, which turns it into business intelligence.<sup>1</sup>

Referring to the solution of the needs of management as a management information system, glosses over the extensive and time consuming detail that is involved. It obscures the planning which determines the objectives of the over-all systems effort; the analysis which combines elements of the existing system, breaking it into easily definable processes and elements; and the design of systems which is the creative aspect combining elements of the existing system with new techniques and processes to build a new system. The term tends to obscure the fact that one is working with the prejudices of people and that applications are limited by the lack of technical knowledge and education of personnel in a business setting where each application is in some respects unique. The term also obscures the fact that care must be given to produce a system with an adequate means of control. The object of such system design must be some optimal balance of sound control coupled with procedures avoiding the creation of an excessive volume of paperwork to achieve the required

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<sup>1</sup>G. L. Phillippe, "What Management Really Wants from Data Processing," Data Processing Today. A Progress Report (New York : American Management Association, Management Report No. 26, 1960, p. 11.



checks and balances. In the abstract, the idea of a management information system is enticing; practical implementation of the related concepts presents problems which should not be underestimated.

The organizational problem is one that has a high priority amongst the list of problems that retail department stores must face in successfully adapting EDP to their purposes. The planning and control function of management requires that management reports be built around the organization structure. In retailing the question of where branch stores fit into the organization and the specific duties and responsibilities of personnel in branch stores is as yet largely unresolved. This situation quite obviously inhibits better report preparation. In addition, frequently the responsibility for controllable expenses is not as fully delegated to the department level in the parent store as it might be.

The introduction of EDP equipment also has implications with respect to the structure and techniques of data handling. There has in the past been a tendency to impose new processing techniques on fundamentally unchanged paper flow procedures. Systems analysis and design has often concentrated on studying existing systems rather than establishing data and information requirements for the future without regard for prior limitations. Gregory and Van Horn, when referring to the data system "structure"

use the term to mean the nature of managerial organization, the origin and type of data collected, the form and destination of results, and the procedures used to control operations.<sup>2</sup> The "techniques" of a data-processing system refer to the technical aspects of the methods used to originate and process data in order to furnish information in some useful form. Gregory and Van Horn point out that a change in either the structural or technical aspects alone seldom result in the best system. Rather, a change in both the structure and technique factors often produces a more efficient and more economical system than is the case if only one factor is changed. Department store management must be more aware of the necessity to revise old organization structure and systems when they become obsolete. An example of this concept drawn from this thesis is the centralization of data processing and new allocation of responsibility required for the processing and report preparation in the fashion merchandising departments.

Concurrent with the problem of system redesign is the problem of re-education. The writer's experience locally has been that, despite the fact department stores have either installed EDP equipment or are in the process of so doing, the knowledge of EDP principles amongst

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<sup>2</sup>R. H. Gregory and R. L. Van Horn, Automatic Data-Processing Systems (Belmont, California : Wadsworth, 1960), p. 390.

retailing personnel is not very widespread. Typically this knowledge has been restricted to a select few in the control divisions of department stores. In the future, department stores must provide for a better introduction of EDP principles to other store personnel so that more experience can be brought to bear on the problems they face. In this way, the technical and practical aspects of EDP in all areas of retailing can be brought together. Areas of department stores other than just the control division would then be in a position to benefit more fully from the equipment.

Underlying all systems study and use of management science methods where these methods are applicable, should be a focus on the information problems of management. Because information and data requirements are the most important determinants of system design, naturally these requirements should always be uppermost in the designer's mind. The more completely organized the data pertaining to a particular problem area is, the easier the problem solution generally becomes. While in earlier applications of EDP equipment to business too much attention may have been directed to technical aspects, there is now a well developed trend toward consideration of the broader aspects of information systems and greater emphasis on the integration and efficiency of data flows to provide the desired information. This thesis has supported the

general tendency toward wider application of EDP to retailing to combat the rising tide of paper work. In view of management's stress on the need for tangible evidence of saving gained through bitter experience, one has difficulty refuting management's logic in concentrating on more commonplace accounting applications. However, it was the contention of this thesis that a legitimate case can be made to justify the use of EDP equipment for merchandising applications.

Fashion merchandise control is a merchandising area which shows particularly good potential for the application of EDP methods. No hard and fast rules exist for applying automated methods in fashion merchandising, but the types of reports presented in the latter part of Chapter V illustrate a start in the right direction. The onus is then on merchandising management to apply themselves in a creative way and to determine more completely the type of reports which are most meaningful to them in carrying out their merchandising functions. They must do this bearing in mind the particular merchandising situations they face and the intimate association and knowledge they have of those problems.

The fashion merchandising application is one which should be integrated into the total data processing system along with the applications commonly done now. Eventually,

in a piecemeal fashion, the management information system in retail stores will probably be constructed.

Recent advances in data acquisition and collection, data transmission, and computer processing hold greater potential for data processing as a retail management tool than ever before. This is important to management because, in the words of S. N. Alexander, Chief of the Data Processing Systems Division of the National Bureau of Standards:

We are emerging from a period in which much of a firm's data served as a historical or police function, rather than a managerial function, and entering a period in which they can be made available to assist management . . . . The importance of an understanding of data usage to the manager should be quite obvious. Once given clear advice as to the use of the data, the manager of data processing can work backward and find out what to gather, how much to gather, and what to process; and he can do an efficient task of meeting the requirements of his job.<sup>3</sup>

The effective use of data processing from a management information standpoint will improve only when systems planning, as a management function, is willing to view data processing in its proper perspective : one element of a management information system which has as its basic responsibility the conversion of data into information for use in making decisions at all levels of retail management.

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<sup>3</sup>J. D. Gallagher, Management Information Systems and the Computer (New York : American Management Association, 1961), p. 59.

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