PERSONNEL MANAGEMENT INFORMATION SYSTEMS

by

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A B S T R A C T

In May of 1967, Dr. L. F. Moore of the Faculty of Commerce and Business Administration at UBC received a grant from the Institute of Industrial Relations, in order to undertake a research study into the "Development of an Integrated Data Bank for Manpower Management and Research." In part, he stated that

> "It would appear that much of the data obtained on employee record form may be made suitable for computer storage, retrieval and analysis. In addition, much of this data is usable in multiple areas of analysis and research."

This thesis, "Personnel Management Information Systems" closely parallels the work of Dr. Moore, as the writer worked for him during the summer of 1967 in the capacity of a research assistant. The content of the thesis to a very large extent represents the work done for Dr. Moore, and is an attempt to lay much of the groundwork in what is eventually to become a more detailed and comprehensive study.

The main problems dealt with in this thesis are fourfold. The initial problem was to ascertain the basic functions of the personnel department in terms of procedures, records and forms employed, information flows etc. and to determine if these functions could be centrally integrated through the use of a manpower data bank. A further area examined was the feasibility or practicability, in terms of advantages and limitations, inherent

in the concept of computerizing personnel records. The third problem involved definition of some of the procedures and methods which are prerequisite to the installation of a manpower data bank. The fourth problem was met in ascertaining the extent to which such installations are presently employed by corporations.

As the concept of personnel management information systems is relatively new, little information was available from the literature. The investigation therefore was carried out through the following procedures: personal interviews with firms in Vancouver; correspondence with large Canadian and U.S. Corporations and the United States government; a review of recent periodicals covering the Personnel function; and from occasional papers covering this aspect of computer applications.

Several conclusions were reached as a result of this study. In view of the many forms, procedures and voluminous amounts of data, it was concluded that the personnel department functions can and should be adapted to computerization through the creation of a manpower data bank. The unlimited potential of such a system is obvious in light of the many functions it can perform. There may be disadvantages for certain firms to implement a system of this nature, but on the whole the advantages outweigh the disadvantages. The systems analysis approach to the problem of determining procedures to take in implementing the system was judged the best technique

to follow. At the present time, computerized personnel records are being employed by many large corporations, with varying degrees of success. Many systems were initially designed with a limited purpose in mind and do not resemble the integrated manpower data bank as presented in this thesis.

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INTRODUCTION

The personnel system may be conceptualized as that portion of the corporation which is directly concerned with the information, decisions, and actions necessary to ensure the availability of the right people at the right time and place to operate, maintain and support the functions of the corporation in a maximally effective manner. In other words, its primary goal is to provide and maintain an appropriately skilled working force. The achievement of this goal requires that the firm maintain timely, meaningful, and comprehensive data pertaining to its employees.

Since the advent of the computer, many functional areas of the firm have begun to look to EDP (Electronic Data Processing) as a source of new and better methods to conduct their day to day operations. The personnel department is no exception. It has been said that:

> "Many companies have used the computer to develop extensive personnel records for specific purposes. In most companies, the first application of EDP to personnel work is usually merely an extension of some record-keeping system that has formerly been handled manually. But with growing experience in the use of the computer wholly new approaches are developed, broadly expanding the scope of data available for better personnel decisions."[1]

This investigation into the use of EDP for personnel

work was prompted by the belief that at the present time, even though EDP has been implemented on a piece-meal basis in the personnel departments of many firms, there was a general lack of information available on the subject. This fact, along with the apparent lack of integration of personnel functions in existing personnel EDP applications indicated that this area should be studied in detail. Some existing systems are discussed in the following chapter and as such document the premises of this paragraph.

The purpose of this thesis therefore is to present a comprehensive picture of how a computerized personnel system should be considered for implementation into corporate activities. In essence, by speaking of an integrated system, an attempt is made in this paper to consider the many personnel functions using computer facilities as a common focal point.

The limitations of the scope of this work must be considered. This paper, in attempting to present a "proper" computerized personnel system, is in reality describing an "idealistic" system. The many constraints on the average corporation, (e.g. economic resources and manpower availability are two) in reality may prohibit complete implementation of the system. Nevertheless such an idealistic system will still highlight many of the achievable goals of EDP personnel applications.

As computer applications are relatively new, they have

brought with them a new vocabulary. Some of these new terms are defined as follows:

1. Data bank - a collection of facts, numbers letters, and symbols, or facts that refer to or describe an object, idea, condition, situation, or other factors, placed upon computer storage media such as magnetic tape, drum, or disc, and made accessible to the computer's control devices through various input/output procedures.

2. EDP - Electronic data processing. Data processing is any operation or combination of operations on data to achieve a desired result.

3. Hardware - a colloquialism applied to the mechanical, electrical, and electronic features of a data processing system.

4. Real time - the processing of data derived from a particular operation in a sufficiently rapid manner that the results of the processing are available in time to influence the continuing operation.

5. Software - the programs and routines used to extend the capabilities of computers, in computer and programmer language, also all documents associated with a computer such as manuals and circuit diagrams.

6. Subroutine - a subset of a computer routine, usually a short sequence of instructions designed to solve a specified part of a problem.

7. System - consists of the interrelationship of personnel, equipment, forms, records, information flows and other facilities involved in accomplishing certain objectives of an organization.

8. Time Sharing - multiple use of a single central processor where results are generally received in real time. The user interreacts with the computer.

Various procedures were employed in gathering information for the content of this thesis. Initially, interviews were held with Vancouver firms, and while many displayed an interest in the topic only three were able to offer assistance. These were: MacMillan Bloedel Ltd., Eatons of Canada, and International Business Machines. Letters were sent to many firms in Eastern Canada and the United States inquiring into their use of EDP in the personnel function. In addition, correspondence with the United States Government's Civil Service proved very fruitful. Personnel and management periodicals were examined closely for comments on EDP and personnel. From an examination of the various duties of the personnel department a model was devised to explain the information flows within the personnel network. From these sources the integrated Personnel Management Information System (PMIS) was devised.

In this thesis, the initial analysis of Chapter II examines the present state of the art, looking at those corporations and other organizations which at the present time employ EDP procedures for improved manpower management. Chapter III examines the manpower management functions through the systems analysis approach, looking at the interdependencies and information flows. Chapter IV deals with the development of input information for the model, while Chapter V deals with the output elements of the system, the routine reports and research and analysis procedures which may be employed to utilize the manpower data available. The advantages and limitations inherent in personnel management information systems are dealt with in Chapter VI. Chapter VII considers some of the future developments which have been foreseen for computers in general and personnel EDP applications in particular. Chapter VIII summarizes the major findings of the paper and suggests areas for future endeavour in this field.

1 Richard T. Bueschel, "How EDP Is Improving the Personnel Function," Personnel (Sept-Oct 1964) p. 60.

C H A P T E R II

PRESENT EXTENT OF UTILIZATION OF PERSONNEL MANAGEMENT INFORMATION SYSTEMS

The content of the following three chapters indicates some goals to which Personnel Management Information Systems (PMIS) designers may strive. However, in practice many of these goals are not presently being attained. This chapter is intended to examine the extent to which EDP is used in personnel departments at the present time, and to comment on some of their applications. The data for this chapter was gathered from personal interviews, written correspondence, and a review of some periodical literature.

I INFORMATION GATHERED FROM PERSONAL INTERVIEWS

Forest Products Company

A local large forest products company has just recently (1967) implemented an EDP system to aid their personnel department. As it presently exists, it contains data only on salaried personnel. Using the proper systems analysis approach the company determined that it wanted the system to aid its employee appraisal procedure and to produce various personnel statistics, and at the same time become a Skill Inventory to aid in the employee search to fill job vacancies and for manpower planning. Working backwards, the planners then designed the input information to meet these output needs. This firm

found that for the proper success of the Skills Inventory, both job position and employee characteristics had to be considered simultaneously so that future "matches" would have grounds for comparison. The analysts discovered that data bank development and coding for the skills inventory presented serious problems but these were overcome. This firm has taken the initial steps to become oriented toward the total Management Information System concept, and the EDP application to its personnel department is a small but nevertheless important part.

Retailing Firm

The Vancouver office of a large nation-wide retailing concern, Eaton's of Canada is at the present time implementing an improved EDP system for their personnel department. Like the forest products company, this firm has recently acquired an IBM Systems 360 computer which as a consequence allows for an increased workload from the user departments. The retail firm was thus expanding its employee file to include more comprehensive data on its personnel. While the designers were attempting to be comprehensive, they have apparently designed it to be utilized mainly for payroll work and to keep a record of the employees' sales activities. From the file description indicating the type of input data required on each employee it does not appear that this system could readily adapt to employ many of the subroutines of Chapter V. Training, testing, previous employment and special skills data are not included in the files, although provision is made for wage and performance

review data. Similarly, almost all of the computer output relates directly to payroll considerations and very little deals with personnel matters as such. Since much of the work involved in the design of their model was supposedly done for its personnel department, the firm could have included much more data in order to gain a better understanding of their employees. Even though this large retailing firm has several large divisions coast-to-coast, the personnel payroll systems were designed on a divisional basis, rather than centralized through the company's Toronto head office. This may prove costly in the future if the company at some point wishes to obtain the advantages of standardized procedures on a national basis, with the head office centralizing this function.

Business Systems Company

The Vancouver division of an international computer and business machines and systems company, IBM, aided in the study. This firm has in operation a partially integrated personnel data system whereby information on each employee is centrally stored at the firm's Canadian Head Office in Toronto. Information stored in the system includes data arising from the selection process, employment history with the firm, records of the education or training completed while with the company, and educational background to name a few. At the time of writing the principal use of this system was for the recording and control of changes in information about individual employees, and

in producing various summarized reports. Many other uses are possible since the data sheet is properly designed to allow for new output reports to be implemented as required. In fact the scope of the system will be broadened in the future.

Personnel research at the present time is limited to the use of a continuing employee opinion survey program. The results of this program are used to assist their organizational planning procedures. This work is completely independent from the Personnel Data system but requires computer facilities to analyze the results.

Through the facilities of the Personnel Data System, this firm is involved in a continuing evaluation of the validity of its personnel selection and placement operation.[1] This EDP personnel system is integrated with the payroll facilities to a certain degree. Computer printouts of the Employee Profile are produced and filed in the head office while copies are sent to the appropriate divisions. An updated and complete file is held on the employee at all times. While the corporation is decentralized geographically it at the present time does not employ terminals for personnel work, preferring at this time to communicate through the mails.

These aforementioned firms represent companies within the Vancouver area who have completely or partially employed EDP for use in their personnel departments. In total, eight local companies were interviewed, and while all firms employed

EDP in some aspect of company operations, generally sales or payroll, only these three firms had installed or were installing personnel EDP systems. Two of the other companies were giving some thought to it, but at the present time priority was being given to other aspects. The other three firms considered themselves too small to advantageously employ EDP procedures for their personnel work.

Attention turns now to those companies and organizations which were contacted by mail for information regarding the status of their personnel information systems.

II MAILED RESPONSES

Automobile Manufacturing Company

A large Canadian automobile manufacturing company, Ford of Canada, has computerized their personnel records without reference to outside data other than some reference to its parent U.S. company. For many years it had used card type tabulating equipment to provide such items as seniority lists, group insurance registers, personnel rosters etc. It was not found practicable with the card equipment at its disposal to provide information such as turnover statistics, personnel selection data, etc. at the present time. The firm is at an embryo stage as far as the computerization of its personnel records is concerned, and do not expect the new system to be operational until late 1968.

For the company, the basic objective was to facilitate the day to day record keeping in a large Industrial Relations activity. The manpower planning and development capability of their system was receiving considerable thought and was intended eventually to be an important tool for personnel planning. Many questions put to this firm could not be answered because at that time it was in a period of change and the system objectives were not yet clarified. However the reasons for the changeover were listed as follows:

1. the desirability of producing for management use personnel data, in greater detail, more readily than was currently possible through the manual and machine methods.

2. the payroll system for both salaried and hourly personnel had been centralized for a number of years and was now computerized. Using this as a base and expanding the tape file with a limited amount of additional data it was assumed the desired information could be secured.

3. as a company they had standard personnel procedures applicable to all company locations, and this enhanced the desirability of establishing centralized personnel records.

4. the volume involved - approximately 4,000 salaried and 11,000 hourly employees made it economically

desirable to computerize.

This firm concluded that:

> "the mechanization of our personnel records is intended to take advantage of improved machine methods to eliminate as much clerical work as possible. It is not intended to reduce employees to a number where they lose their identity as individuals. We expect the system to be a better set of tools and provide management with information on their employees so that a better job can be done for both the company and the individual." [2]

In the United States, considerable work has been done by at least several large organizations in the development and operation of personnel management information systems. Consideration at this point is given to some of these systems, then the results of three surveys undertaken in the USA to determine the extent of EDP applications to personnel work are examined, concluding with an examination of how computerized personnel systems are being employed by agencies other than corporations to aid the job seekers to meet the employee seekers.

NASA

The National Aeronautics and Space Administration (NASA) the organization responsible for the United States space flight program, has established a computerized Personnel Management Information System (PMIS). PMIS was established to provide NASA with a means for making special studies, for general management purposes, and to assist the agency in responding to

external reporting requirements. Essential information about each NASA employee was gathered together and channelled into an agency-wide data base utilizing EDP techinques. NASA felt that they needed some centralized source of personnel information since their management activities were decentralized, with both authority and responsibility for carrying out personnel operations delegated to the field installation level. PMIS provided them with the tool to centralize and consolidate data on approximately 36,000 employees located in ten large research centers and a few smaller installations within the USA.

Personnel operations of this type of concern differed from those of a private company. One major difference was that the entire public system must operate within a highly specialized code of laws and regulations designed to insure integrity and merit within governmental units. Profit motives which characterize private systems were replaced by broader concerns for the public health, welfare, and security within an economic frame of reference. It was their hope that the PMIS could better aid their personnel departments to attain these goals. At the field installation level, a personnel representative from John F. Kennedy Space Center, NASA, had this to say:

> "This Center has maintained and utilized a comprehensive data bank of personnel information since 1962. This has been a production oriented ADP system which was designed to eliminate the need for manual preparation of personnel transactions and the preparation of both

> routine and special reports for management and control purpose. The various payroll change notices made necessary by promotions, within-grade or quality step increases, and pay adjustments as a result of Congressional action are examples of the former. Inputs to various national surveys such as those performed by the Los Alamos Scientific Laboratory and the Sandia Corporation, along with a multitude of reports on distribution of personnel by occupational grouping, grade tenure, sex, or some combination of these required by regulation, statute or executive order are examples of the latter " [3]

In addition, NASA attempted to use the system widely to assist in the development of personnel compensation estimates and projections in support of budget requests and Civil Service manpower ceiling adjustments. The system presently in use was apparently also designed to provide quick response to frequent requests for special demographical studies relating to the occupational character and physical makeup of their work force. To date however, NASA has not utilized the system to aid in manpower analyses other than as a base for providing standard reports regarding the current occupational structure of the labour force. It was contemplating incorporation of a record of training provided to government personnel which it was hoped would assist greatly in the execution of surveys of training requirements and serve as a base for comparing training levels and needs between organizations. NASA also wished to do some research on health studies, and in the future attempt more esoteric studies of stress in relation to occupation and specific tasks performed under extremes of pressure. As advanced as the PMIS program was, it was obvious that at the time of writing the men involved in its operation were not satisfied

that it had reached its full potential.

U.S. Civil Service Commission

Perhaps one of the most ambitious programs yet developed by any organization to aid management in its personnel operations is the U.S. Government's Civil Service Commission program known as the Executive Assignment System (EAS).[4] It was established:

> "to ensure that the Federal Government will continue to have sufficient numbers of top quality career executives to meet any future need; to encourage the development of a Federal executive staff committed to the overall purposes of government rather than to one agency or program; to give outstanding executives expanded opportunities to use their talents throughout the government "[5]

A discussion of the advantages of the system ensues in Chapter VI.

In essence, the EAS is a government-wide executive staffing program, made possible with the assistance of high speed data processing equipment to perform the clerical operations. It was developed with the aid of the companies and Federal Agencies (e.g. NASA) that already had implemented executive development and selection programs, and was implemented November 1967. At the time of writing the Executive Assignment System was restricted to the approximately 5000 upper positions (called grades GS 16, 17, and 18) of the Executive Branch of the U.S. Civil Service, and refers to the positions within the Branch. At the same time, the Executive

Inventory refers to people, approximating 25,000 Federal executives in grades GS 15 to 18. The Executive Inventory is the prime source of employees selected to fill positions in the Executive Assignment System. The EAS was thus primarily designed to aid in the selection process through a procedure identical to the Skills Inventory approach to be discussed later. In filling career posts, agencies would have to consider all well qualified personnel in the Executive Inventory, not only those available under internal agency merit promotion programs.

The first step in filling a position in the EAS involved the identification and recording of the specific qualifications requirements of the particular position. This was done by the management official directly responsible for the performance of the employee holding the position. In searching for candidates for the position, the computer would use this description as a guide. Following the Executive Inventory search process, a computer printout listed a preliminary report of those persons who best met the basic qualifications of the position to be filled. The human evaluation process began at this point, and narrowed down the field further until the most qualified candidate was assigned to the position in question.

The Inventory Record was the document that had to be filled out by all employees in the Executive Inventory. It

was an exhaustive set of questions which gave the personnel decision makers much information in their search to choose the right man. It was prepared with a great deal of effort by the Civil Service Commission and will undoubtedly enable the EAS personnel researchers much leeway in the future to conduct prodigious amounts of research. At the present time it is designed to serve these major purposes:

1. executive manpower planning - much more could now be done to exactly determine the executive manpower needs of the Federal Civil Service.

2. executive search and selection - as described previously for the Executive Inventory. However it offered new facilities to provide for outside recruitment to fill career assignments.

3. executive training and development - required for the specialized type of work performed by government employees, training needs could be better pinpointed.

4. special recognition - the CSC assumed that top government executives had earned wider public recognition than they had received, thus the EAS would bring attention to the achievements of their long term executives by highlighting their contributions.

5. the future - the EAS was the first step in building the model of the personnel system for the top levels

of federal and civil service. In spite of all that this system accomplished, the following aspects were being considered:

a. the extension of the EAS to positions not covered in the initial stages.

b. the addition of flexibilities in assignments of executives within and among agencies to provide even greater executive mobility into the upper civil service.

In conclusion, the Executive Assignment System appeared to be more advanced than the systems of other organizations considered. While it did not appear to be integrated with the payroll aspects it nevertheless provided a firm base which the average personnel department would be wise to emulate.

Utilities

Two papers have given a brief indication of how two large U.S. utilities have employed EDP to integrate their personnel and payroll records.[6, 7] One, a gas company, had been running an integrated personnel-payroll system since mid-1965, designed to reduce duplication of effort in their payroll and personnel operations. A centralized Industrial Relations Department coordinated the activities of the two departments.

The other firm, an electric utility, realized as well

the similarity and common requirements of both the payroll and personnel departments. A survey indicated that the areas of overlap were many and thus the two functions were united.

While both these companies had "integrated" their personnel and payroll functions, it was obvious from an examination of their papers that both were utilizing their EDP systems mainly for payroll purposes. The information carried in the data bank on each employee was certainly not designed to meet the requirements of the system described in the previous chapters, yet they were considered here as they seem to be quite representative of the general use of computer applications to the personnel-payroll concept.

U.S. Navy

On the other hand, the Office of Naval Research of the United States Navy attempted to construct a futuristic model of the Navy Personnel System.[8] In attempting to apply the techniques of Operations Research to the analysis of the System, they devised a quantitative model which permits the estimation of Personnel System effectiveness under alternate programs of personnel action.

The nature of the personnel problems for the Navy were in general unlike those of the average corporation, owing to the transient condition of employment and logistical factors involved. The determination of numerical coefficients for

their model required much research work to be done on their personnel variables. EDP procedures were thus employed to aid the researches in this work. The resulting product, the model, by necessity very complex, was primarily directed toward increasing the effectiveness of the naval personnel system. If such a model could be devised for the Navy Personnel System, and serve its purpose accordingly, then it would indicate to the personnel departments of large corporations a goal that they may some day wish to achieve as their own PMIS systems become more sophisticated.

III RESULTS OF SURVEYS

Three different surveys were recently carried out in the United States to determine the extent to which personnel departments are utilizing EDP procedures, and these are examined at this time. The first survey considered here is one mentioned by Elizabeth Lanham[9] which concerned a study of some manufacturing and non-manufacturing firms in the United States. A second survey by R. T. Bueschel[10] covered 89 firms engaged in a wide variety of industries. A third survey by Dickmann[11] indicated how research companies utilized various storage media for their personnel files. These surveys are considered in turn.

Lanham Report

The survey referred to by Elizabeth Lanham considered

333 companies and revealed the extent of EDP utilization as well as some of the procedures, practices, problems and advantages reported by the responding firms. The problems and advantages are considered in the following chapter.

Of the 333 firms which reported, 254 utilized EDP procedures in one or more phases of their operation. Of these 254 firms, 142 used EDP for personnel reports and records, 97 were planning or considering its use, and the remaining 94 indicated there were no plans at all for EDP in their personnel departments. Lanham also considered: reasons for utilization; administrative arrangements required; personnel requirements for the EDP-Personnel Department complex; an examination of the types of output records produced; and cost aspects. She also found that

> "by far the greatest use of EDP was for payroll data ... most of these payroll records and reports being kept on the basis of individual employees, jobs departments, devisions and overall company classifications in order to provide the detail required for effective payroll administration." [12]

Lanham concluded that the gap between the number of personnel installations and company EDP installations would be narrowed in the future as the benefits of EDP systems became known to personnel administration.

Bueschel Survey

The second survey considered here is that of R. T. Bueschel.

It was carried out to fill a need that he thought existed in assessing the current (1966) use of data processing by personnel departments and was designed to determine actual and potential applications of EDP. He found that personnel departments most often apply EDP to the personnel functions listed here in most to least order of frequency of use: employee records; compensation, including fringe benefits and wage and salary analysis; skills inventories (discussed previously); labour relations; and employment. In addition, he found that the responding companies made limited use of EDP in training, testing medical records, and motivational planning.

Considering economic aspects of EDP installations, Bueschel found that very few personnel departments had any real idea of the costs of their EDP activities, or their pre-EDP personnel activities, and thus could not objectively determine if savings were made. The major advantages indicated by the survey are considered in a following chapter.

Some firms (20%) indicated that in the future they would be considering real-time systems, while an equal percentage planned to include Personnel as a part of their overall company information system. Surprisingly, in only 5 per cent of the cases were the payroll and personnel systems integrated or combined in the same file, although 75% of the firms felt it was desirable to combine the information of these functions. One of his findings can be related to the comments of Chapter IV

concerning the actual data to be held within the data bank. It is mentioned at that time that the list of conceivable data input is open-ended and that each individual firm must determine its own needs. Bueschel found that key items in the model considered previously such as "termination code" and "reason for hire code" were only recorded by one per cent of the firms. Under these circumstances 99 per cent of the firms would be unable to carry out employee termination analysis!

In summary, Bueschel's survey indicated that much is yet to be done before the complete integrated personnel management information system proposed in the earlier chapters is realized by a significant number of organizations.

Dickmann Survey

The third survey was that considered by Dickmann and his associates:

> "to determine the approach scientific and engineering organizations are taking to automate personnel records, the nature of such systems, the degree of success which has been encountered, and the efforts made toward developing a structure of technical skills." [13]

The survey indicated that most of the differences among firms' utilization of various storage media appeared to be a function of the size of the organization as measured by the number of professional employees.

The results of this survey indicated that an actual need

for the automation of personnel records was first seen as a firm approached 500 professional employees. As the firm grew in size the need became more obvious. At the level of 1000 employees automation was used to simplify clerical tasks for each area of personnel, but these automated subsystems were not integrated into one working record system. For the firm size of 2000 employees or more there was a trend to integrate several automated subsystems of personnel data. Of the responding firms 65 per cent were engaged in some activity related to the development or utilization of skills information. It was mentioned that organizations having useful skills inventories found it necessary to develop a skills listing tailored to their particular organization.

IV OTHER EDP TECHNIQUES

Attention now turns to another concept made possible by EDP applications. Instead of the internal skills search discussed previously, consideration will be given to the external skills search. In effect this involves a discussion of how EDP techniques are being applied to aid companies in their continual search for new employees. The workings of two agencies dedicated to these purposes, the National Manpower Register (NMR) and the College Placement Council (CPC), both United States organizations, are discussed at this point.

National Manpower Register

The National Manpower Register was formed in 1965, and consists of a nation-wide affiliation of employment consultants specializing in professional placement. NMR and its affiliates are all tied into a modern sophisticated computerized information retrieval system. It was designed initially to aid in the placement of engineers, scientists, and computer professionals.

The system operates as follows. An applicant submits his resume to NMR, which prepares a standard one page form which is duplicated for each affiliate. An analyst codes the qualifications for entry into the computer, a real time system operated by General Electric. One page hard copies are filed numerically at NMR headquarters. When an employer asks for a specific search to be made, the NMR or affiliate counsellor queries the computer directly from the console located in each office. The computer then searches its memory, attempting to find the applicant whose qualifications best match those desired by the employer. Seconds later it will type out the internal (i.e. NMR assigned) registration numbers of applicants who fill the qualifications. The hard copy file is then received by NMR or affiliate counsellors to evaluate each computer match and determine if any special instructions from the applicant exist. The employer receives the hard copy resume and if further interested will contact the applicant directly. The employers benefit by having a much larger pool of qualified

personnel to choose from, the applicants benefit by having a free service which efficiently distributes their qualifications to all areas of the country they are interested in working in. In summary, the National Manpower Register greatly facilitates communications between employers and potential employees.

College Placement Council

The College Placement Council is a non-profit association of colleges, universities, and employers which has its headquarters at Lehigh University in Pennsylvania. It is a nation-wide service for the placement of alumni of the more than 1000 participating colleges and universities. It became operational in February 1966 using a medium-sized computer with time sharing capabilities. The students registering with CPC pay a ten dollar fee and the five thousand industrial employers who are members of CPC may make enquiries of the file for a nominal charge. The mechanics of the CPC system are very similar to those described for the NMR. At the time of writing, the CPC was in its embryo stage and it was not known if it had been successful or not. One major disadvantage was that the top students generally obtained employment through campus interviews and did not have to rely on CPC facilities, thus the less qualified students were the ones who may utilize the CPC. If this were true, a reduction in quality could discourage employers from making active use of the files. The CPC planned at the time of writing to extend their services to teacher

placement and later student (summer) placement.[14]

The potential for such national employment pools is tremendous. This approach, especially if used by the Federal government and provincial or state agencies, could accelerate the mobility of the nation's labour force. Such a scheme has been studied in a report to the President's Committee on Manpower (U.S.A.).[15] Their general proposals considered the need for better information flows between job openings and job seekers, through the creation of new agencies to achieve these ends. EDP procedures similar to the NMR or CPC are essential if such programs are to be carried out.

Summary

This chapter has attempted to present a reasonable picture of the present state of the art of EDP applications to the personnel area and related fields. It must be concluded that on the whole most firms were not utilizing EDP facilities to their full potential. Firms appeared to be planning only for present, immediate needs, and were not concerning themselves with the integrated approach suggested in previous chapters. There was an obvious gap between the Personnel Management Information System concept and the personnel EDP systems which exist in practice.

1 As an observation, it is estimated that this firm has one of the most rigorous selection procedures used by any corporation today.

2 Quoted in a letter from a personnel executive of the automobile company concerned.

3 Quoted in a letter from a NASA personnel executive at the John F. Kennedy Space Center.

4 John W. Macy Jr., "The Executive Assignment System," Civil Service Journal, (October-December, 1966) p. 2.

5 Ibid p. 4.

6 E. D. Meyers, Integrated Personnel Record Keeping Systems -- Columbus and Southern Ohio Electric Company, a paper presented at the National Conference of Electric and Gas Utility Accountants, New Orleans, La., May 1966.

7 D. L. Simmons, E.D.P. Integration of Personnel-Payroll Records at Tennessee Gas, a paper presented at the National Conference of Electric and Gas Utility Accountants, New Orleans, La., May 1966.

8 R. H. Gaylord, et al, Operational Analyses of the Naval Personnel System: Part I Development of a Personnel System Model A report by the American Institute for Research for the Office of Naval Research, United States Government, December 1959.

9 Elizabeth Lanham, "EDP in the Personnel Department," Personnel (March-April 1967) p. 16.

10 R. T. Bueschel, "EDP and Personnel," Management Bulletin 86, American Management Association, Personnel Division, 1966.

11 R. A. Dickmann et al, Information Retrieval in the Personnel Department, (Silver Spring, Maryland, The Johns Hopkins University, April 1964)

12 Lanham, op cit, p. 21.

13 Dickmann, op cit, p. 2.

14 Bueschel, op cit, p. 9.

15 Donald Schon, The Role of the Government in Technological Forecasting, A Report to the President's Commitee on Manpower, January 1966. p. 6.

C H A P T E R III

THE PERSONNEL FUNCTION AND THE SYSTEMS ANALYSIS APPROACH

I INTRODUCTION

Yoder has said that:

> "As labour management becomes professional, the field of employment relationships will take on more of the characteristics of an applied science or art, similar to such other applied sciences as engineering, education or medicine. As an applied science, the field will accept, use and apply the theory and principles of the basic disciplines and sciences. [1] In addition it will develop principles of its own."

Perhaps at no time has there been an opportunity to advance the field of personnel work more than at the present time. This is made possible by the new role being played by Electronic Data Processing (EDP) procedures and equipment, by utilizing the computer to manipulate large amounts of data and perform research and analysis programs that were until now virtually impossible. This chapter deals with the practices and procedures which are involved with the establishment of a computerized manpower data bank, the Personnel Management Information System. It will concentrate on the development of an integrated model by considering the various functions of the personnel department in the context of an integrated whole

rather than a variety of unrelated sub-functions.

For the purpose of the construction of an integrated model, a major assumption requires that the principal features of an employees' status can be described in a basic single record. If this basic record can be maintained in a current and accurate condition, and if proper documentation can be produced in automated forms for the changes which occur, then reports in great variety may be obtained as by-products of the automatic record keeping process. Records must necessarily start with the individual, for information about groups of staff organized to achieve an end is based on what is known about them as individuals. The data bank should attempt to hold as much data on the employee as is conceivably and ethically possible, for it must be realized that much future work (in terms of output) will probably be done which will utilize programs not conceived of at the present time.

An important limitation to the development of a manpower data bank model must be considered. The literature is unanimous on two points: firstly, the model should be designed "backwards," i.e. the output desired from the model determines what information is to be placed in the data bank, the information input is in theory at least not supposed to determine output; secondly each firm must design its own model to accomplish its own ends, it cannot "borrow" other models and expect them to meet their own needs. Consequently the model presented here must remain a generalized concept and thus much

of the discussion will be open ended to allow for the specific requirements of individual firms. However, it is hoped that even in light of this limitation, adequate information will be presented to aid the personnel manager in his future plans for an EDP application to his function.

II FUNCTIONS OF THE PERSONNEL DEPARTMENT

At this point some consideration is given to the separate functions of the personnel department. As much of this is repetitive of what is found in the literature only a general review of these functions is considered here.[2] A personnel system model has been prepared attempting to indicate some of these functions and their interrelationships within the total personnel department environment (see App. A). The major operations of the personnel department may be summarized as follows:

1. Recruitment - the purpose of recuitment is to match the requirements of the staffing schedule and to utilize effective means of attracting needed manpower in sufficient numbers to permit adequate selection of an efficient workforce. Related closely to the recruiting function is that of manpower planning projecting manpower needs to the future which is necessary if the recruiters are to hire for the future needs of the corporation.

2. Selection, Placement and Induction - the selection process may be complicated or simple, depending upon corporate policies. It could include such procedures as: preliminary screening; review of application blank; reference check; aptitude and psychological testing; physical examination; and employment interviews. If the candidate is found to be suitable, placement procedures follow to place the employee in that type of employment for which he is best suited. Induction procedures attempt to acclimatize the applicant to his new environment, to create a favourable impression and attitude and establish a sense of belonging.
3. Employee Evaluation - the employee evaluation process involves the use of ratings as an objective indicator of the employees' achievements and value to the firm. It brings an awareness of the differences among employees, and determines their weak and strong points. It is related to the training procedures to be discussed later.

4. Promotions, Transfers, and Separations - these represent the means employed to change the size of the firm's work force. Promotions may be based upon ability, merit, or seniority, and are a morale creating device, providing a logical training for advancement. Transfers involve lateral shifts in employment, and generally do not comprise any appreciable increase in responsibilities and

duties. Separations may be voluntary or involuntary, depending upon the circumstances of termination, and involve a reduction in the work force.

5. Wage and Salary Administration - this is a complex procedure which comprises: job analyses which yield job descriptions; the relationship between the various jobs which yields a job structure with an inherent wage or salary scale structure; a mechanism to compare outside wage and salary data with that of the firm. Wage and salary administration is closely related to payroll and performance appraisal procedures, and involves consideration of the many determining factors for remuneration.

6. Health and Safety - this includes such duties as: creating and maintaining interest in safety aspects of the employees' work; reviewing accident records; carrying out surveys and inspections of procedures and equipment; determining and applying remedies to reduce the likelihood of future accidents; applying safety programs; and keeping a close watch on the employees' state of health.

7. Training - training is related to the employee evaluation procedures which may determine employee training needs. Training programs may exist at all levels for all types of employees for many specific purposes. This

could include: job training, either supervisory, vocational, executive, or technical; induction and orientation programs; and other special courses. The training group must ensure that only those employees are trained who are lacking in qualities which the training program offers, thus there exists the problem of selection and content of training program to match potential trainees' needs.

8. Record Keeping and Statistical Reporting - record keeping and reporting are necessary functions of the personnel department, and relate to the information flows essential to carry out the main work of the personnel department. Reports are always required by the various departments of the firm, other firms requesting information, by government agencies, and for a host of other needs. Statistics cannot be generated unless factual information is held on record by the personnel department. Meaningful statistics result in a greater understanding of the effectiveness of procedures carried out by the personnel department.

It has been suggested that:

"While the personnel or industrial relations departments of most business organizations maintain extensive files of various types of employee data, such as application forms, test results, turnover records, absentee records and supervisory appraisal records, very little effort is made to integrate this data for administrative efficiency, much less for analytical or research usefullness. It would appear that much of the data obtained on

> employee record forms may be suitable for computer storage, retrieval, and analyses. In addition, much of this data is usable in multiple areas of analysis and research."[3]

This chapter and the following two chapters represent an attempt to achieve these ends, in light of the several key personnel functions.

Before examining the actual content of the manpower data bank model, consideration will be given to some of the important concepts which must be considered prior to the establishment of a Personnel Management Information System.

III ADMINISTRATIVE FACTORS

To enhance the success of the Personnel Management Information System, certain administrative adjustments have to be made. Methods and format of originating information have to be made uniform. Local managers have to be persuaded that they are not losing control of their real jobs, although they will be less concerned about routine work. New arrangements have to be made to ensure that a smooth flow of action will follow a firm timetable. Staff have to be helped to accept the change of duties and sometimes of location. Wille sums it up by stating that:

> ". . . A sound working partnership has to be achieved between all departments in the organization and the computer department to achieve these objectives, and parochial boundaries must be broken down in the process: knowing how to manipulate the computer hardware and write programs is only part of the story."[4]

Environment

The environment in which the organization exists will determine to a fair degree the extent to which effort is put into the creation and operation of the model. The more important the nature of the employee's function is, and the more scarce his skills, the more the firm may be willing to install an EDP application within the personnel area. For example, a firm employing largely university trained technical personnel may wish to know more about their employee variable than the contracting firm which employs labourers and craftsmen. Government policies and requests for information may indicate to a certain extent the types of data output required, and thus enhance the effectiveness of an EDP application for reporting purposes. If the firm is large, it will probably be requested to supply salary and other personnel data to research firms and other organizations, and will undoubtedly be continually besieged by special requests for information on a variety of personnel matters. The legal environment may play a large role in determining certain data needs for such government agencies as the Workman's Compensation Board (safety reports) and Canada Manpower (National Manpower planning needs). Increased competition in a tight labour market may require the firm to utilize new and better procedures to keep existing employees and attract an adequate supply of qualified applicants.

Coverage

Organizational and technical factors must be considered in the design of the Personnel Management Information System. The exact coverage of the number or types of employees to be included in the manpower data bank must be determined. Some firms have computerized data on only their salaried employees and omitted hourly paid employees. The PMIS may be centralized in the firm's head office, or the branches may design and operate their own systems with guidance from the head office. The coverage of the various personnel functions within the manpower data bank must be determined; a fully integrated system would by definition include all the personnel functions, but in certain corporations it may not be possible or even advantageous to do it.

Language Problem

Technically speaking, the language problem is important if many of the EDP programs are to succeed. If possible, information should be stored so that it can be retrieved regardless of the viewpoint of terminology employed. This may be solved by developing a vocabulary consisting of a complete set of terms used to describe all individuals in the system. Again it must be emphasized that these considerations must be dealt with each firm individually based upon its own needs. The greater the number of factors considered, the larger the data

in storage, the greater will be the problems of coding, storage, and subsequent retrieval. As the system becomes more sophisticated, the greater the costs are; this economic limitation is in essence one of the primary factors.

IV THE SYSTEMS ANALYSIS APPROACH

The personnel system may be regarded as a unified entity which should be designed to take full advantage of equipment capabilities and new management science techniques as a better means of attaining their goals. Under this approach the personnel system is viewed as a whole rather than as a department composed of individual, unrelated operations. The procedure generally employed to ascertain the needs and benefits of this concept is known as the systems analysis approach.

A general description of the systems analysis techniques is indicated in Figure 1. This study requires three major phases. First, it is necessary to acquire an understanding of the present system. Second the results that are desired from the system must be determined. Finally, equipment must be selected and procedures devised to efficiently attain those results. The objectives of systems study and design are to develop new procedures or improve existing procedures so as to increase the effectiveness of operations and, if possible, to bring about greater economy.

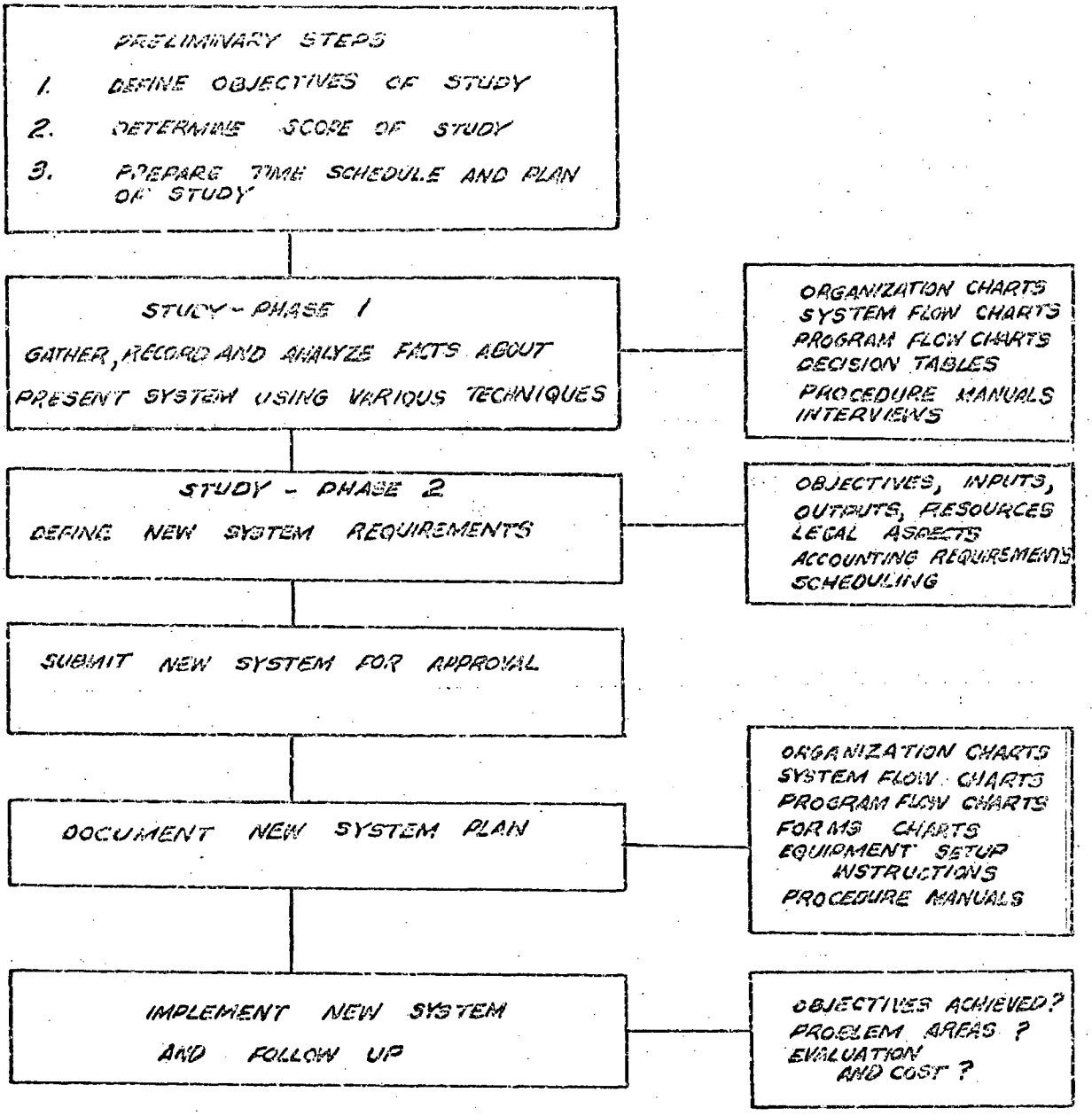


FIGURE 1

THE SYSTEMS ANALYSIS PROCEDURE
(From Arnold, Introduction to Data Processing, p. 293)

Initial Stage

Initial actions and procedures taken follow the systems analysis approach once an EDP installation has been approved for the personnel department (or even if it is being considered). Once the aims and objectives of the personnel department have been clarified, the records and procedures required to attain them must be determined. All potential user departments must be involved in this procedure to avoid the ill-will and confusion of an "us-them" attitude. The finished product must reflect the positive contributions of all involved. However at this stage it is the systems analyst, generally reporting to an EDP manager, who sets the pace and ensures effective methods are followed throughout the study.

At this stage consideration is given to what the personnel functions ought to be doing as a unified department and what records and information is required to do it. From the overall objectives, or the desired output, the planning team can work "backwards" to establish what information should be fed in and how it must be processed to reach the desired objectives.

Many records are of course essential. For example the employee must be paid, thus wage and salary information is required, the firm must be able to follow the employee's progress, thus evaluation and job history data is essential.

However during the course of the data and record accumulation, data does not have to be duplicated. The basic principle of integrated data processing is that irrespective of the number of purposes for which it will be used, a fact is only recorded once.

Designing New System

Once the basic requirements of the system have been determined, the systems analyst turns his attention to the specific details of the personnel system. The analyst concerns himself with the dynamics of the PMIS operation, designing the data input and output flows, and the data bank itself for maximum efficiency so the system can be easily manipulated to produce easy-to-use print-outs and analyses, yet be sufficiently flexible to handle contingencies as they arise in the future. Each step must be particularized so that the programmer will understand how to translate the systems analysts recommendations into machine language. The personnel representative should be closely involved to ensure that all procedures are precisely spelled out. Definitions have to be precise; who authorizes these payments? how offen does X happen? what user departments receive this printout? etc., everything must be questioned.

Summary

Since the analysis of this thesis deals with an

imaginary system, it is not constrained by the economic considerations or other limiting factors which would restrict the real-life firm. To a certain extent this model is similar to the idealistic "frictionless" models so often called upon by engineers to describe their ideas in a world of "unfrictionless" reality. Having considered some of the factors and problem areas met by practioners in the world of EDP applications to personnel work, the examination now turns to the components of the Personnel Management Information System.

1 Dale Yoder, et al. Handbook of Personnel Management and Labour Relations, (Toronto: McGran Hill Book Company, 1958), p. 1-29.

2 For a detailed description of the functions of the personnel department, as well as references for this topic, see Yoder et al, Ibid.

3 These were the words used by Dr. L. F. Moore of the Faculty of Commerce and Business Administration of the University of British Columbia in his request for a grant-in-aid of research to study the topic of Personnel Management Information Systems.

4 Edgar Wille, The Computer in Personnel Work, (London: Institute of Personnel Management, 1966), p.8.

C H A P T E R IV

DEVELOPMENT OF THE MODEL - INPUT

The discussion of this chapter attempts to show how the various functions of the personnel department may be interrelated or integrated into one manpower data bank. The manpower data bank model must contain certain elements: it must have data; the data must be coded; the information must be stored on some medium; means must exist to store and retrieve the information as desired; information flows must be clearly delineated; means must exist to control the quality of the input data as well as update obsolete data; and finally the whole Personnel Management Information System must be periodically reviewed to ensure that it adapts to meet new and changing needs. These elements are considered in further detail now.

I DATA DETERMINANTS

The information which is held in the data bank is the key feature of any EDP personnel application. Essentially the data to be included is determined in two stages.

Comprehensive Listing

Initially, all the facts which may be known about an individual, an all-inclusive list, is prepared. The most minute input may turn out to be essential to some output requirement. It should be kept in mind that once a fact is deposited, procedures must exist to keep it updated. Such an initial list includes all data presently hald manually, but consideration is also given to possible future requirements, with viewpoints coming from all levels of the organization. An example of such an initial comprehensive list of possible ingredients of a data bank is attached in Appendix B. An individual firm would undoubtedly wish to add to this list their own particular data, but such a list is adequate for the purpose of this work.

Sieving Process

The second stage is a sieving process, whereby an attempt is made to relate the possible input considered in the first stage with the system output needs determined by the systems analysis procedure. In choosing the appropriate data the following questions should be answered: who are the potential users of the facts? what are the reasons for holding the information - is it current transaction data or standing reference data? and finally what are the main uses of the facts? The exhaustive list of facts prepared in the initial stage is trimmed by the systems planning group to exclude

details which are superfluous to the individual firm's needs. Data which is useful to one firm may not be useful to another firm.

As the concept dealt with here is that of an integrated data bank, the model would be expected to contain at least a minimal amount of information on each of the key personnel areas considered in the previous chapter. The specific actions taken by specific companies in order to carry out similar procedures would necessarily be more complex as they have set policies and procedures to use as guidelines.

For any input data fed into the computer, endless permutations of output are possible. Wille adds:

> "It is not necessary to ask, 'can the computer do this or that for us.' Feed in the basic facts: the computer can do it. There is no magic about it. But in defining needs spare a thought for the complexity of the program and the expense of keeping the record up to date."

The fact that an integrated model has been designed means that certain types of data must be kept within the data bank. The data collected for this model reflects the needs of the output to be described in the following chapter. However, certain types of information are not appropriate for computerization, owing to the volume of words required to describe the specific situation. For example, narrative descriptions of job interests and previous job responsibilities may be at the present time best left on manual forms.

II CODING PROCEDURES

Definition

Codes are defined as a system of characters and rules for representing information in a language that can be understood and handled by a computer. Coding is a system of writing in which numbers or letters, or a combination of both, are used arbitrarily to condense and classify data. Since coding is an abbreviating device, it minimizes the work required in recording and rewriting data. It will not only standardize the output data, but it makes data gathering easier and conserves storage space within the system. In addition, codes provide a convenient means of identifying and distinguishing data for classification purpose.

Generally, when coding procedures are employed, the use of explanatory tables on separate storage media within the data processing system is also considered. Following this approach, data can be stored in the employee's record as codes but printed on documents in alphabetic form for easier recognition. An overabundance of codes on form printouts would generally render the forms less readable and thus less useful.

Coding Methods

[2]

While there are many commonly used coding procedures the most suitable method employed in personnel EDP applications is known as sequence coding, whereby a list of items to be coded

is arbitrarily assigned numbers from one up, until the list is exhausted. There does not have to be any particular order to the list, but once code numbers have been assigned to an item they cannot be changed.

Proper coding procedures greatly ease the workload on the computer and are very adaptable to personnel EDP applications. In fact, because personnel work on the computer mainly involves the storage and retrieval of large amounts of data, coding procedures are essential.

The role of the personnel department is essential at this stage. As part of the systems analysis approach outlined in Chapter III, he must define in plain English how he wants to subdivide staff and facts about them. It is a simple procedure to attach numbers to these facts once the breakdown has been determined.

The number of categories acceptable for coding is of course dependent upon the volume and types of data computerized on the manpower data bank. An individual firm having its own peculiar data requirements will also require its own coding procedures. However there is a large number of codable facts which are common to most organizations, and these are illustrated in Appendix C.

Of particular difficulty in the coding procedure is the previously mentioned language problem of job and skills codes. This is perhaps the most complex aspect of the manpower data

bank model, and is considered shortly in the discussion of the Skills Inventory.

Code Categories

The various codes may be categorized as follows:

1. general information codes: facts are listed in numerical order such as provinces, area or division of employment etc.

2. job and skills codes: are used to describe job positions, they generally are represented by the company's own description of positions. However tables of job descriptions have been prepared by the Federal governments (Canadian and U.S.) and these codes should be adaptable to most firms.[3] This concept is closely related to the Skills Inventory.

3. nature of action codes: describe the nature of action used to change the employee's status etc. Examples here include reasons to describe transfers, promotions, and separations.

4. condition codes: indicate whether or not certain conditions are met generally in answer to a question. For example "yes" and "no" indicate whether certain conditions exist. Also included here could be codes used to describe the condition of employment - temporary,

part-time or full-time, etc.

5. remark codes: relate to document output, and are mainly used in notification reports to management. An example of this would be "Employee Evaluation Due __ __ ," when a computer search of the files has indicated that a certain condition exists that a certain report must be issued.

The coding system presented in Appendix C has been classified into the above categories.

III DATA STORAGE AND INFORMATION FLOWS

Data processing systems make a comprehensive personnel data system feasible. Once the appropriate data has been chosen and the proper codes employed, the data is placed in some storage medium. However since the various data processing systems vary in size, complexity, speed, and cost, there are consequently several types of storage media. The major types of storage facilities include punched cards, magnetic tape, random access files (drum or disc storage) and tape/random access file combination.

A Data Processing System

An example of a centralized data processing system is illustrated in Figure 2. It consists of a centralized data

processor which contains the employee's data (i.e. the manpower data bank). Connected to this system through various communication links are the divisional terminals which provide for the transmission and receipt of personnel transactions as they occur.

The system illustrated in Figure 2 utilizes six basic devices: the printer, direct access storage, sequential (tape) storage, a central processor, a transmission control, and a divisional operating terminal. Through the use of direct access storage, personnel transactions can be processed rapidly, providing fully-updated and accurate records as they are required. The sequential storage is employed to log personnel transactions as they occur, and can thus provide an audit trail and historical data for reports and analyses. The transmission control is the connection link between the central processing system and the divisional operating terminals. It allows multiple division operating terminals to communicate simultaneously with the central data processing system and verifies the accuracy of all data transmitted to and from the system. The divisional operating terminals are the communication link for the handling of personnel information at each division location and consists of a control unit, a card reader, a printer-key board and a printing card punch. This discussion has considered a system which is currently as "sophisticated" as modern technology will allow, and is also known as a real-time system.

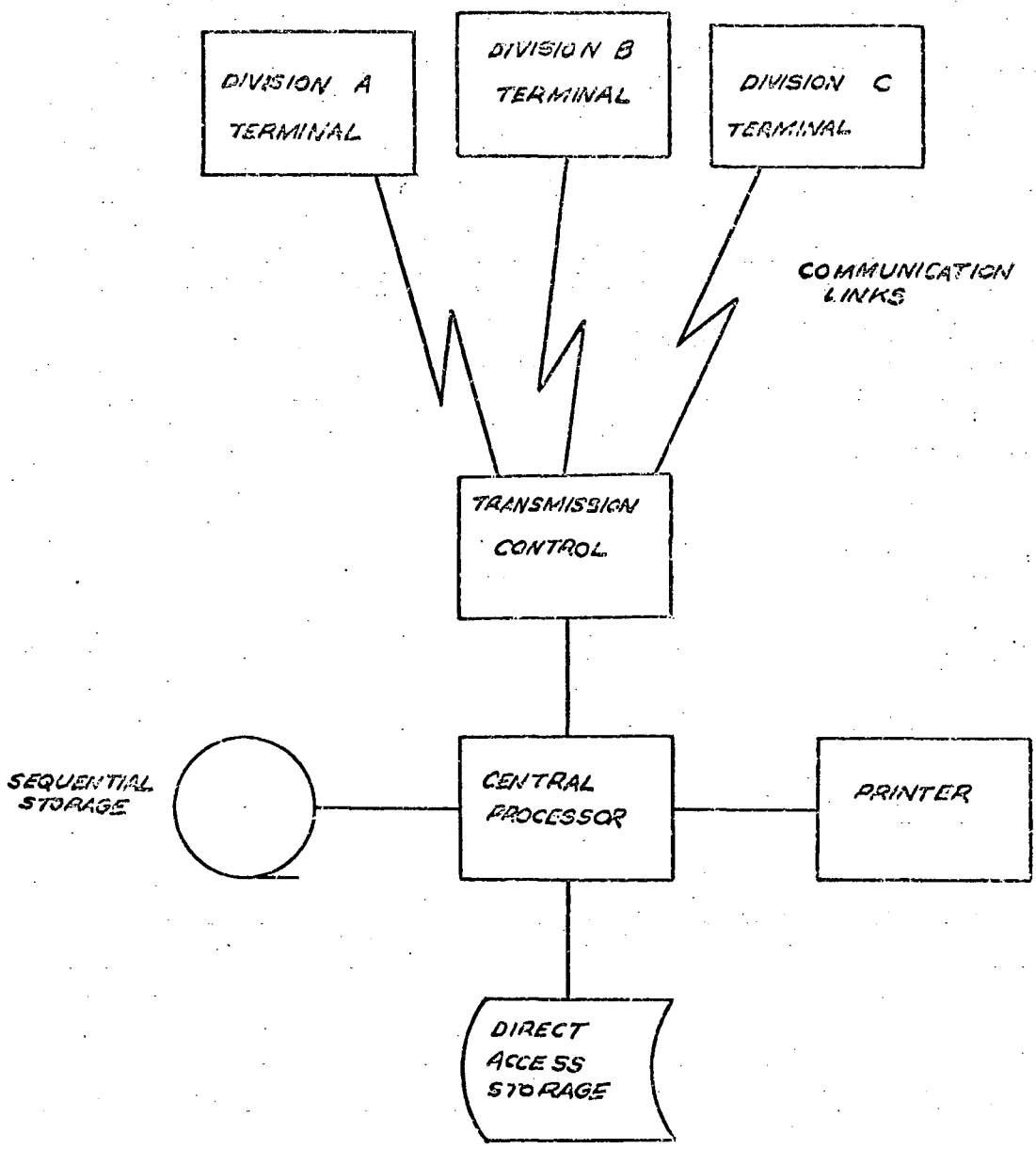


FIGURE 2

A CENTRALIZED REAL-TIME DATA PROCESSING SYSTEM
(From IBM Manual E20-0273-0, p. 7)

Input and Storage Media

At the present time, the most common means of transferring information from report form to computer storage is accomplished through the use of punched cards. All transactions originating at the divisional level and affecting personnel records are entered into the control unit as punched cards. There are various procedures employed to transfer the data from the punched card to the computer storage.[4]

As explained earlier, the data is generally held on sequential or random access media. Magnetic tape is known as a sequential record since all records on the tape must be read in sequence before the desired record is reached. In more recent storage devices such as disc storage, a random access device, the designated information can be reached directly without scanning all of the other records ahead of it in sequence. Thus random access devices have an important advantage over sequencing devices, especially if a "real-time" application is being considered. These are technical considerations and need not be considered further here. However in latter parts of this chapter some diagrams will be employed to describe computer procedures and these will show the manpower information being held on "Master Files" and will be designated as magnetic tapes.

The general design of the information fields of the punched card input is shown in Appendix D. It indicates how positions for various coded and uncoded information are

allocated to certain cards. Where possible, the cards are designed so that the various source departments have a minimum number of different source cards in which to originate data on the employee. For example an evaluation card or a medical card may be designed to serve a specific purpose for the source departments, and for administrative efficiency would represent the only forms used for these purposes. Each card however must have "key" numbers to indicate its sequence with respect to the other cards, and to identify the employee involved. The identification number in this example is the employee's social security number. The information punched on these cards for any employee represents the total "computerized" information which is held on him. The sum of all the information pertaining to all the employees, along with the practices and procedures involved, represents the Personnel Management Information System.

Consideration now turns to some of the information flows which are necessary to ensure the smooth operation of a manpower data bank, and attention is focused on the interaction of the several departments involved.

Responsibility Flows

A mechanism must exist to ensure that the proper procedures are employed in the operation of the Personnel Management Information System. An example of a procedure to follow is illustrated in Figure 3, showing the relationships between

four main responsibility centres.

The personnel department is responsible for the non-payroll aspects of the employee variable discussed earlier in this chapter. This involves the coordination of all employee activities and information flows within the company. The personnel department is concerned that computer reports are distributed to the proper receivers, ensures the flow of updated and new data to the manpower data bank, and supplies prerequisite data to the payroll department so that the employees are properly paid. However, under the PMIS system, a new opportunity for analysis and research arises as many of the personnel department employees are freed of time-consuming routine tasks.

The payroll department receives wage and salary administration data from the personnel department, including wage rates, pension plans, insurance schemes, bond purchase plans, etc., and applies this information to the calculation of wages. It also receives time and attendance data from the operating departments, which matched with wage rate data yields the employee's pay. This data is sent to the EDP department where the automated equipment calculates wages and prints cheques.

The Input-Output Control Centre, usually part of the personnel department and staffed by personnel people, coordinates all activities between the EDP installation and the payroll and personnel departments. The Centre checks input data

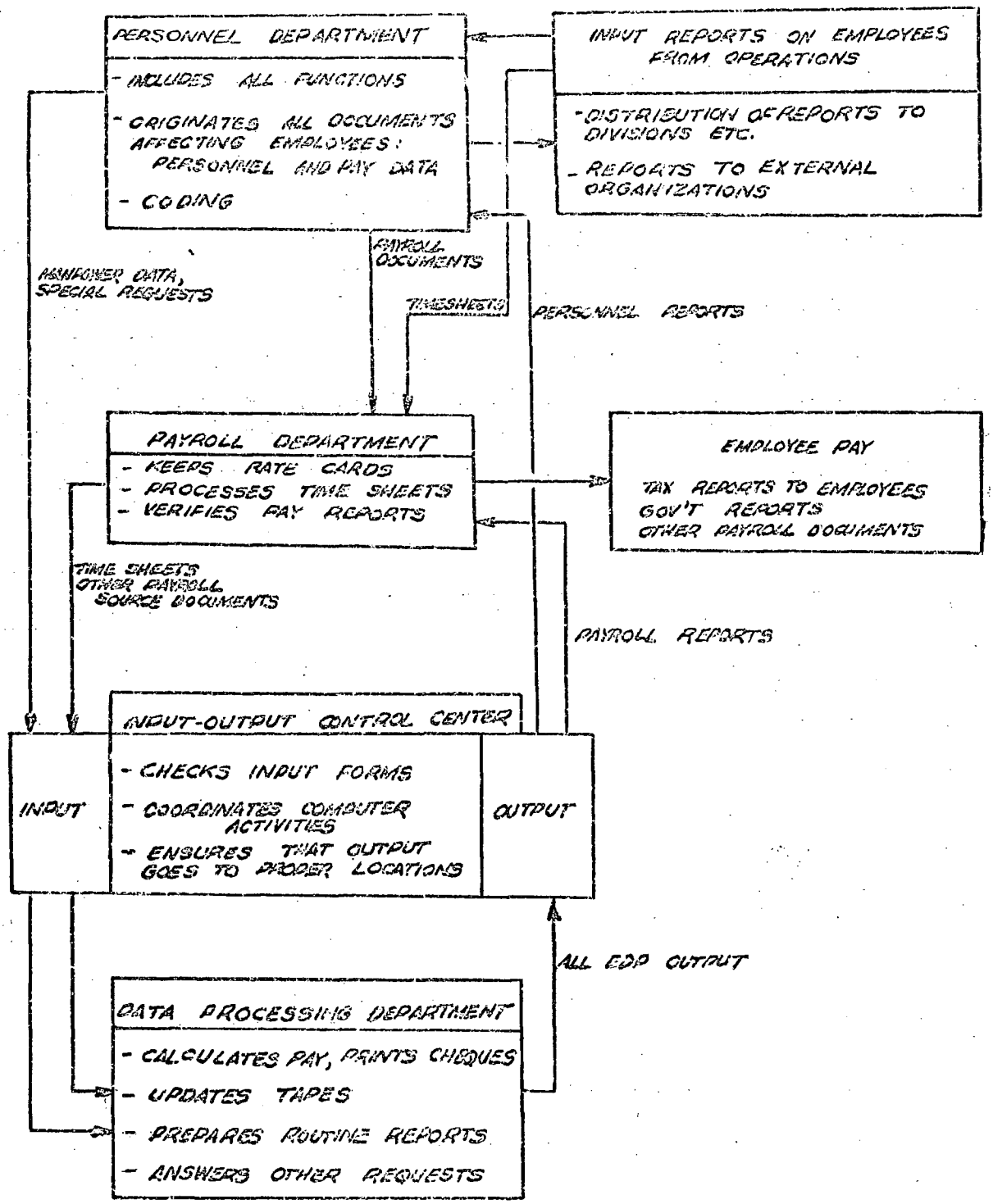


FIGURE 3

PMIS RESPONSIBILITY AND INFORMATION FLOWS

for format and completeness before the information reaches the EDP department. It also receives all computer output and ensures that it is sent to the proper user departments.

The Data Processing Department is responsible for the operation and maintenance of all computer facilities and files. This area calculates the payroll (and prints cheques), updates all the files with new information as received, and prepares automatically the routine reports required by the personnel and payroll departments. The EDP department represents the physical location of the manpower data bank. The computer programmers are located in this department should either the personnel or payroll departments originate a request for a special report or new service.

Forms Required

In order to carry out the numerous day-to-day routine tasks of the personnel department, a large information flow is required. While it has been common practice in the past to have a multitude of reports and forms to assist this information flow, new procedures are required if the firm is to implement a personnel management information data bank.[5] Previously, forms and documents were designed to be placed in many physically separate files, thus data often would be duplicated.

However, in the EDP application, forms are designed with the manpower data bank in mind, as indicated in a previous

section. Data does not have to be duplicated except for the key number (usually social insurance number) and name. Forms may be organized so that the employee or originating source of data may use codes on the originating document. While it is not feasible at this time to present a large list of new data forms that could be employed, it must be appreciated that such a procedure should eliminate much paper-work, organize data flows more efficiently, and reduce overall data requirements. As before, if the forms employed are actual computer cards, a great deal of inefficiency may be eliminated.

Some of the types of forms are listed in Appendix E. Each form should relate to a data position within the manpower data bank, either to update or change old information, or to place new data into it.[6] The proper design of the forms is a major factor in the increased efficiency resulting from the EDP application to the personnel department.

EDP Flowsheets

Within the EDP department itself consideration must be given to some of the procedures required to keep the Master File (containing all the data on all the employees and assumed here to be magnetic tape) in an updated condition and to make use of the information held within the manpower data bank. Figures 4 and 5 illustrate these procedures.

Figure 4 illustrates an example of a procedure which

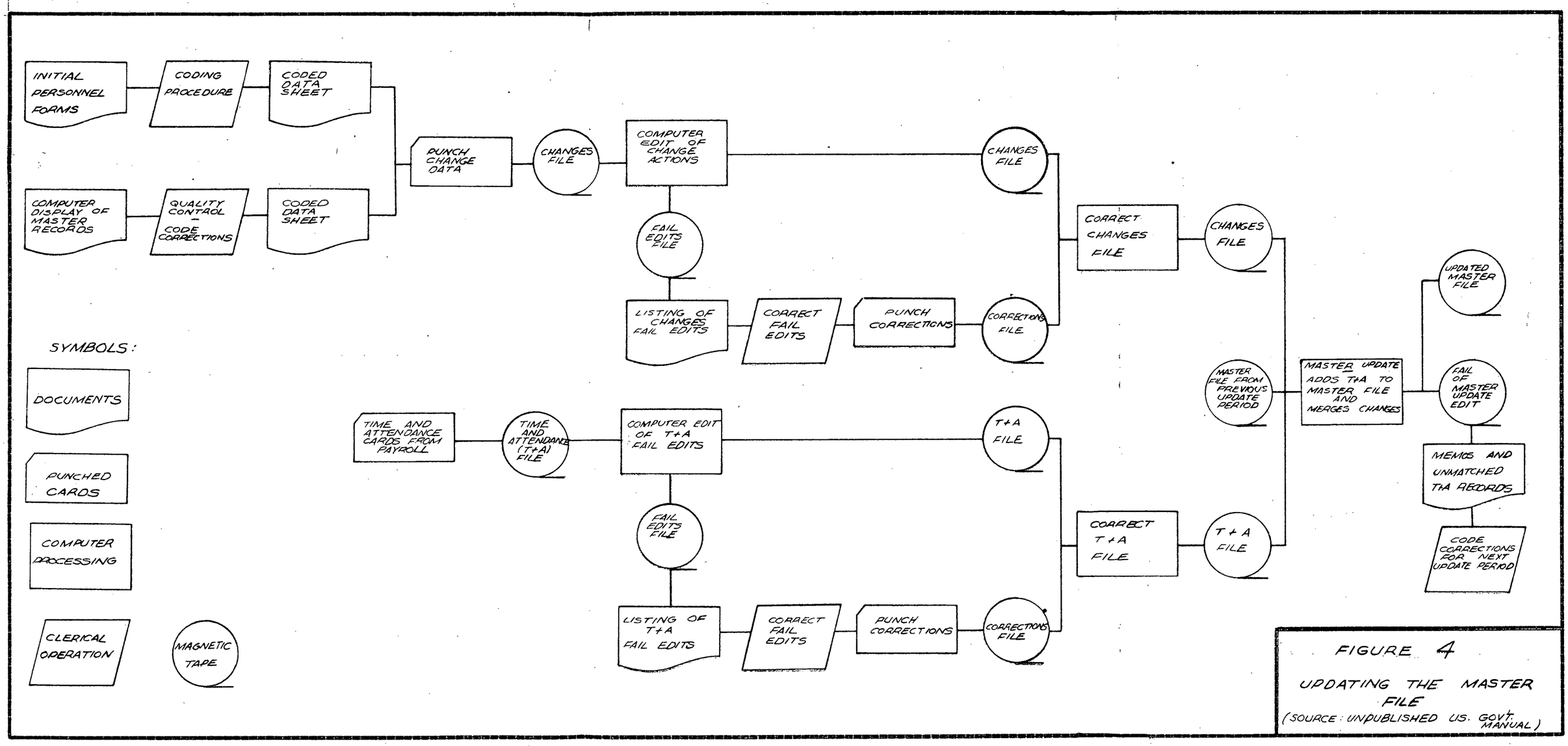


FIGURE 4

UPDATING THE MASTER FILE

(SOURCE: UNPUBLISHED U.S. GOVT. MANUAL)

could be employed to update the integrated personnel-payroll Master File. The updating procedure can be carried out in periodical (usually weekly) additions to two files, the Changes File and the T&A (Time and Attendance) File. New personnel data and corrected data from the previous Master are coded, keypunched, and transferred to the Changes File. A computer edit of the Changes File looks for specific errors the computer is programmed to discover. All errors are listed, corrected, repunched and put onto a Corrections File which is joined with the Changes File to produce a corrected Changes File.

While this procedure is being carried out the weekly Time and Attendance cards from payroll are going through a similar process. The editing and correcting procedure produces the corrected Time and Attendance File.

At this time the Changes File and the Time and Attendance File are merged with the Master File from the previous updating period. This adds T&A data onto the Master and completes all changes which were previously on the corrected Changes File. The product of this step is a new updated Master File, as well as a File of Failures from the T&A updating procedure.

The updated Master File (the manpower data bank) is the source of all output reports as it contains all the computerized data available on the employee workforce. The failures of the T&A updating procedure can be corrected for the next updating period.

This updating procedure represents a batch process whereby changes and additions to the Master File are made periodically in a lump batch. Under the real time system described earlier however, these changes could be made within the data bank as they occur, and thus at any instant the Master File would be updated.

Figure 5 indicates procedures carried out on an updated Master File. Initially three procedures may be carried out: calculation of wages and salaries for the previous period; additions to the Separations File of data on employees who have left the firm for various reasons; and an Actions File which lists all actions taken by the computer automatically such as automatic pre-programmed pay increases; status conversions from conditional to permanent, etc.

Following these programs the Master File may be put through a Notification Program. This program in actuality represents the "watchdog" aspect of the Personnel Management Information System. The Notification Program will automatically produce memos to notify management to take actions on such aspects of personnel work as job evaluations which may be due, placement followup procedures, due promotions, etc. The following chapter deals with these ideas in greater detail.

At this point the fully updated Master File may be analyzed to yield the research and analysis information on the employee variable which makes the concept of the PMIS worthwhile.

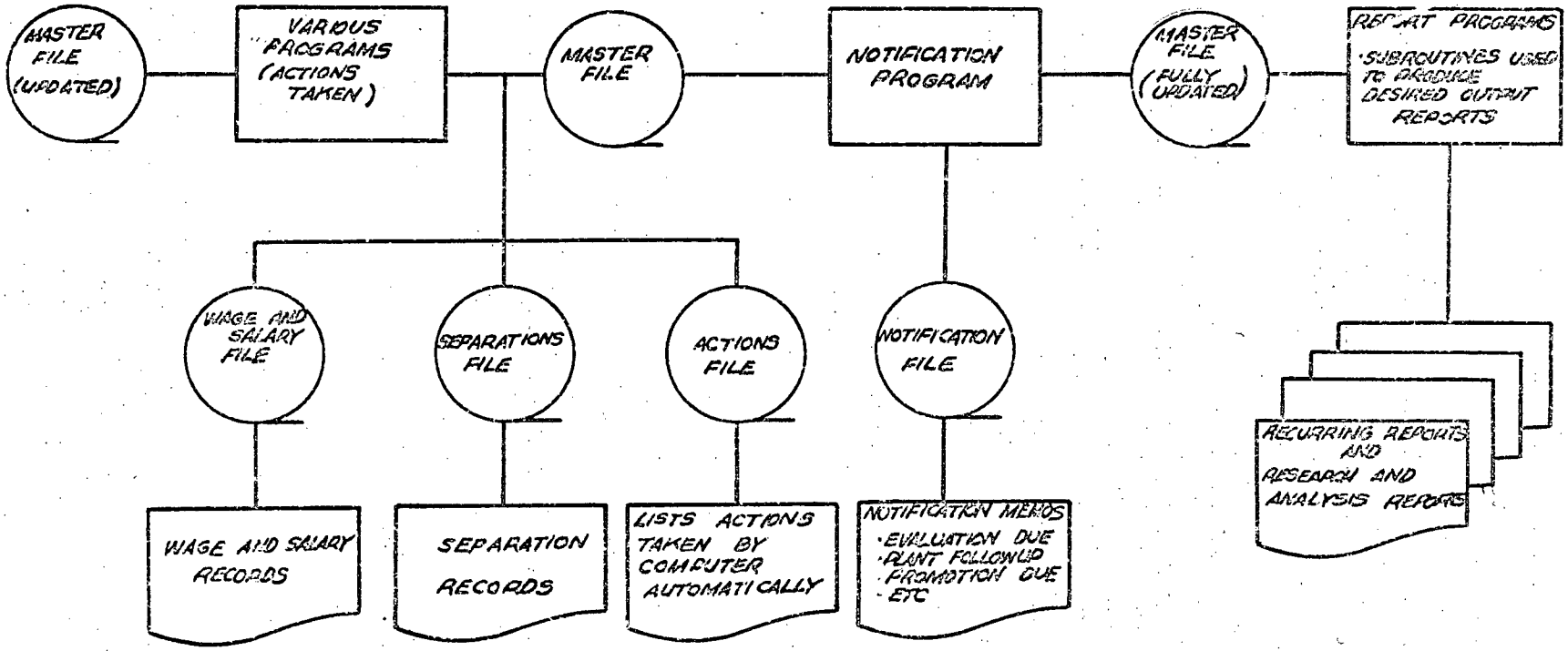


FIGURE 5

PMIS OUTPUT

(Source: Unpublished U.S. Government Manual)

Standard programs to yield routine reports are run at this time, as well as the required research and analysis programs to determine the pertinent employee data relationships. An infinite number of programs can be run on the one basic Master File. Any special requests from internal or external sources can be quickly answered if facilities and personnel exist to write the subroutines necessary.

Summary

This chapter has attempted to illustrate how the input information into the manpower data bank is derived, coded, and deposited. It has shown how the systems approach is employed to determine the key variables and the most efficient procedures to acquire optimum results. The basic fundamentals of such a program have been discussed here, rather than the specific details of an actual system with its inherent intricacies. Each firm must of necessity design a system to meet its own needs. Some ideas have been presented here in the hope that they will aid in this process.

At this point attention turns to an analysis of some of the uses to which the data held within the Personnel Management Information System may be utilized.

1 Edgar Wille, The Computer in Personnel Work, (London: Institute of Personnel Management, 1966), p.8.

2 For a detailed discussion of coding procedures see Arnold, et al., Introduction to Data Processing, (New York: John Wiley and Sons Inc., 1966), p. 52.

3 This book is known as the Dictionary of Occupational Titles and is a United States' Government publication.

4 See Arnold, op cit, p. 205.

5 See Yoder et al. Handbook of Personnel Management and Labour Relations (Toronto: McGraw Hill Book Co., 1958) p 1-29.

6 For an exhaustive list of forms see Yoder, op cit, p. 22-1.

C H A P T E R V

THE MODEL OUTPUT: REPORTING, RESEARCH AND ANALYSIS PROGRAMS

I INTRODUCTION

At the end of the preceding chapter it was concluded that since all the pertinent manpower data was updated and readily available on Master File, heretofore practically impossible work could now be carried out examining the employee variable. This chapter deals mainly with the programs and procedures which would be utilized to obtain meaningful and timely information from the manpower data bank.

While this chapter follows the chapter describing data bank input, initial comments should be kept in mind that the complete model is properly derived in reverse. Thus this section may represent the systems analysis approach in that here, in defining PMIS output, in essence involves defining the goals of the system. Nevertheless, computer output naturally follows computer input once the system has been designed, and is therefore being considered in this order.

Generally speaking, the utilization of information held within the data bank is limited by the following considerations: the information content of the data bank; the total number of

possible combinations of this data; the imagination and foresight of the personnel department in determining its needs.

This discussion cannot be expected to include all the potential uses to which the data could conceivably be put, yet nevertheless some of the major, more obvious programs will be examined. In many cases the firm may wish to test and verify, if possible, many of the time-honoured traditional concepts widely held with respect to the employee variable. Properly designed tests, and means of work and attitude measurement, etc. may shed new light on old ideas. Through computer-aided research, meaningful data on the labour force may be found to shed light on the types of people best suited for particular jobs. Some of the qualities of people who find job satisfaction, especially in the lower level jobs, may be determined. Research may be done on the advantages and disadvantages of leisure time and its effect on the work force. In a rapidly changing world, it may be found that research is required to help firms help not only themselves but also employees and the government to adapt to the many problems facing them today. However, such research and analysis programs require the manipulation of large amounts of data, and prior to the advent of the computer, these procedures were almost impossible.

II SUBROUTINES TO UTILIZE DATA

Once the data has been placed in the manpower data bank, there exist many procedures in which it can be manipulated to

yield pertinent information. The desired information may vary from request to request, thus a mechanism must exist whereby the data held can be retrieved to suit certain purposes. This is accomplished through the use of mini-programs commonly called subroutines. Each subroutine may have an assigned number or code name and be stored within the overall program. At the beginning of each run the computer is programmed to execute the desired subroutines and will therefore yield certain output.

A Subroutine Example

Within each subroutine, questions are asked of the main data bank and answers are received. By asking different combinations of questions of the available data, various purposes can be served. The essence of a subroutine procedure is illustrated in Figure 6, this type being in the form of a decision table. This decision table represents a subroutine which could be employed in an airlines reservation system. The questions asked of the data are indicated as conditions 1-5, the actions possible to take are considered from 1 to 6 at the botton of the table. A vertical column of satisfied conditions and subsequent actions is called a rule, and in the example there are eight rules. Y indicates that a condition is satisfied and N indicates that it is not, while X shows the actions to be taken. This subroutine works as follows, for example:

			RULES							
			1	2	3	4	5	6	7	8
CONDITIONS	1	FIRST CLASS REQUEST ?	Y	Y	Y	Y				
	2	TOURIST REQUEST ?					Y	Y	Y	Y
	3	FIRST CLASS OPEN ?	Y	N	N	N		Y	N	
	4	TOURIST OPEN ?		Y	N		Y	N	N	N
	5	ALTERNATE CLASS ACCEPTABLE ?		Y	Y	N		Y	Y	N
ACTIONS TAKEN	1	ISSUE FIRST CLASS TICKET	X					X		
	2	ISSUE TOURIST TICKET		X			X			
	3	SUB. 1 FROM FC AVAILABLE	X					X		
	4	SUB. 1 FROM TC AVAILABLE		X			X			
	5	PLACE ON TOURIST WAIT LIST			X				X	X
	6	PLACE ON FIRST CLASS WAIT LIST			X	X			X	

SYMBOLS:

FC	FIRST CLASS
TC	TOURIST CLASS
Y	YES - CONDITION SATISFIED
N	NO - CONDITION NOT SATISFIED
X	ACTION TO BE TAKEN

FIGURE 6

A SUBROUTINE PROCEDURE IN DECISION TABLE FORM
(From Arnold, Introduction to Data Processing, p. 300)

1. rule 1 - for a First Class (FC) request and when a FC is open, then a FC ticket is issued and 1 is subtracted from the number of FC seats available.

2. rule 3 - for a FC request, but neither FC nor tourist Class (TC) available, but any alternate class acceptable, then the request is placed on the FC and TC waiting lists.

3. rule 6 - for a TC request, when a TC not available but FC is and the passenger will accept an alternate class then a FC ticket is issued and 1 is subtracted from FC available.

Decision tables similar to these are employed to describe subroutines within the PMIS. They represent a clear and concise way of representing a method of analysis within the subroutine. In some cases program flowcharts are employed but on the whole they require more space and are harder to follow.[1]

Other Subroutines

A list of some feasible subroutines which could be employed to carry out various reporting and research and analysis functions is shown in Appendix F. This list is certainly not exhaustive and many more programs could conceivably be added to it as various needs arise for the individual firm. In some cases several subroutines could be employed simultaneously to yield a single report.

The subroutines are generally self-descriptive after the reference name used for each subroutine is a short description of its use. When used with the organization chart (also in Appendix 6), the table indicates the probable recipient of the output report. In addition, an indication is given of the type of data required to be in the manpower data bank if the program is to be run. Some data may have to come from other files, for example turnover analysis would have to be done employing the Separations File. Most of the programs illustrated are either the routine reporting or simple research and analysis variety. Much of the more involved and complex research studies which could conceivably be done are beyond the scope of this paper. The inherent advantages of such programs, which can produce large amounts of desired reports and studies with a modicum of clerical labour, should become obvious at this point.

III OUTPUT AND THE PERSONNEL FUNCTIONS

In a previous chapter attention was given to some of the functions of the personnel department. It is pertinent at this point to indicate how some of these functions are integrated or related to the manpower data bank.

Recruiting

The computer may be used as an aid to the recruiting function. Owing to the large number of applications usually

dealt with by the average large firm, an EDP system adapts readily to advantageous use by the recruiter. If information flows can be centralized and smoothed to permit rapid communication, then fast notification of disposition of application, posting of actions taken, and preparation of reports can be systemized and automated. Proper use of EDP procedures would permit provision of means to retrieve resumes on applicants possessing specific qualifications. As time passed and such a system remained in operation, comprehensive records could be obtained for the analysis of recruiting programs and activities. It should be technically possible to have all the necessary data of applicants on one file and then to transfer this information to the employee Master File if they are engaged in employment.

Research based on current employees judged to be better than average may offer ideas to the recruiter on what characteristics of the applicants who may best fit in with the company; i.e. may aid the recruiter to become more selective.

Training

If the firm has a definite training program and can identify its training needs relative to the overall organization, then the manpower data bank can be employed to help to ensure that all employees receive adequate training relative to their positions. Generally, all training data is put on computer

cards and transferred to the Master File. At the end of a certain period or as desired complete training record outputs can be derived from the data bank. These records may include a monthly recap of training activities, surveys of costs of training programs, and a complete listing of employees trained and the type of programs offered. As more and more training data becomes available the firm will be better able to analyze their program to pinpoint areas of maximum benefit from their training programs. The training area offers a good source of reduced costs by adapting to EDP equipment and procedures.

Wage and Salary Administration

Many of the other personnel department functions benefit from integration into the PMIS. For Wage and Salary Administration the benefits are obvious: the data generated by the computer is up-to-date prerequisite information for the proper analyses and comparisons to be done. The Health and Safety records, which can be integrated with the PMIS, facilitate comprehensive and meaningful report writing, as well as further analysis on health and safety programs. The reams of statistics and general information permitted by the EDP application allow the personnel people to spend less time doing routine work and more time managing manpower.

The Skills Inventory

Perhaps the most useful EDP tool yet employed for

manpower management is that of the Skills Inventory. However, while experience has shown it to be one of the most difficult aspects to computerize, it is nevertheless one of the most important segments of PMIS output.

In essence, the Skills Inventory is designed to find the right person for the right job, providing all levels of management with a tool for more effective job placement and manpower planning. Analyses of the qualifications of all employees can be performed in a matter of minutes. The purpose of this discussion is to indicate briefly how the desired output is obtained in relation to the Skills Inventory input.[2]

The largest single difficulty in the design of the Skills Inventory system is the language problem - the skill terminology must be precise and brief so that computer techniques can be used in searching records for skills or combinations of skills. However once the proper data has been gathered and appropriately coded, updating procedures are easily employed to ensure that ensuing skills and experience gained by the employee are incorporated into the file.

The second part of the Skills Inventory approach occurs when the manpower data bank Master File, which includes the Skills Inventory data, is searched for the desired skills. A search request may be entered into the system in punched card form, as illustrated in Figure 7. When the system locates a match in skills, the information required in the search is

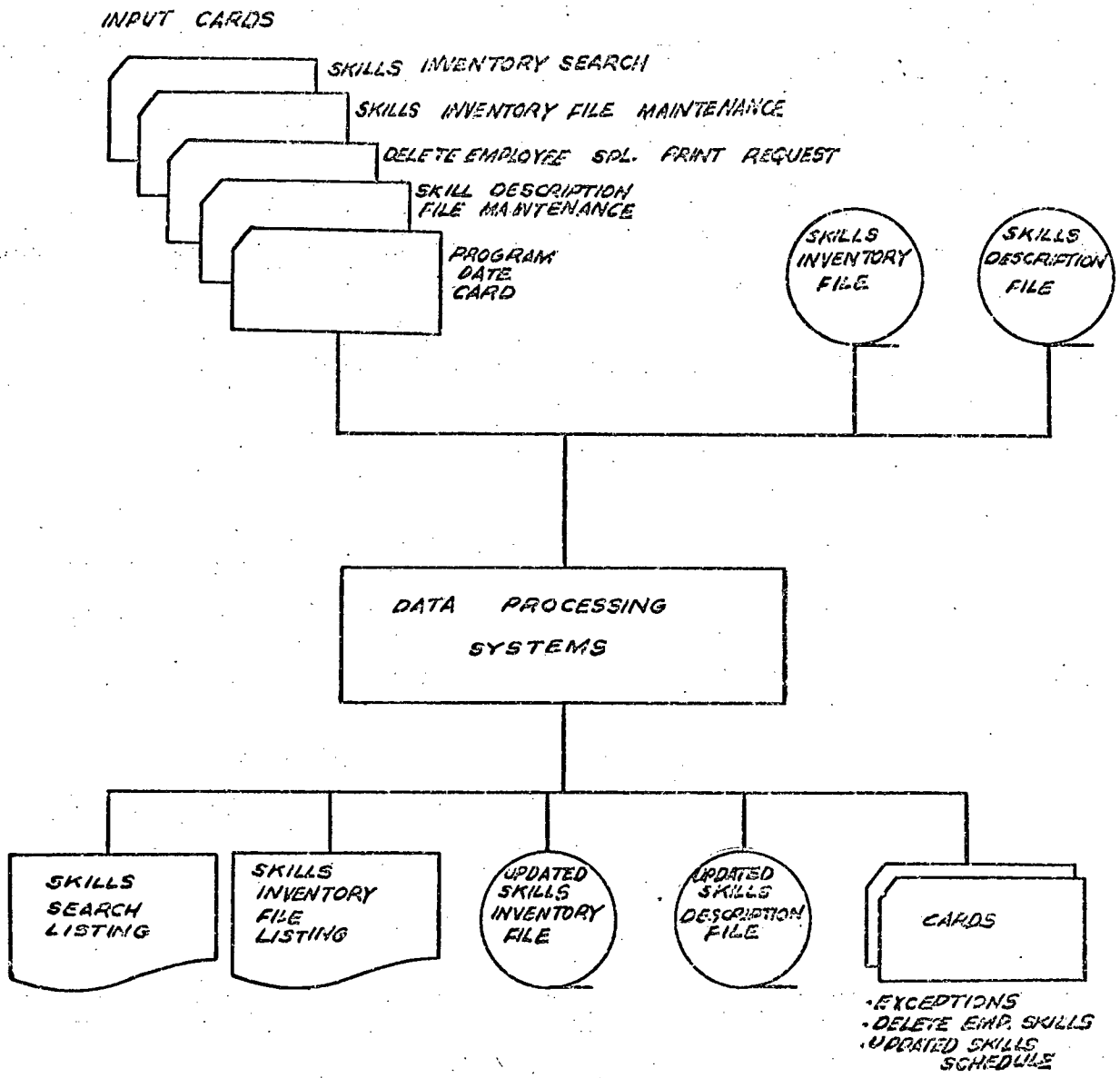


FIGURE 7

A SKILLS INVENTORY PROCEDURE
(From IBM Manual E20-0035-0, p.20)

stored for printout. The Skills Description File is utilized to explain, in the printouts, the codes which were initially employed when coding the employee's skills.

Management should decide what skills are important and how the inventory will be used. Most skills inventories were designed initially for job placement purposes. However, in recent years they have been used to an increasing extent to evaluate the manpower capabilities of a company, in manpower and product planning, and retraining planning. It is obvious that only that data which is recorded can be retrieved. An attempt should be made therefore, to anticipate the amount of detail that may be desired in the future and to include this from the beginning. The system should also be flexibly designed so that as new experience is gained in its use, additional data can be incorporated with a minimum of effort, and search and updating techniques can be improved. If the skills inventory is implemented as part of the integrated manpower data bank, then promotion aspects may be included as an added benefit if competency at each skill is included.

Other Personnel Uses of the Computer

Discussion up to this point has considered how EDP techniques can be utilized as an aid to the personnel department through data stored within the manpower data bank. However, other procedures exist whereby the personnel department is aided by EDP methods.

An example of this is the use of outside data on employee variables: results of tests, wage and salary data, sickness and absenteeism, and accidents etc. These "outside" variables may be statistically compared to the firm's own variables using existing regression and correlation capabilities of the computer.

Certain tests such as motivational and morale surveys, where the employee remains anonymous and thus are not included within the Master File, generally require the sifting and sorting of voluminous amounts of data. Again the computer can readily be employed to aid in this procedure.

Summary

This chapter has dealt with some of the useful outputs which can be obtained from the Personnel Management Information System. Again it must be pointed out that a prodigious amount of computer output is possible from a properly designed system, and that each firm must determine its own needs.

1 For a detailed discussion of flowcharting principles see Arnold, et al, Introduction to Data Processing (New York: John Wiley and Sons Inc., 1966)

2 A comprehensive description of a Skills Inventory procedure is given in IBM manual E20-0035-0, Personnel Skills Inventory.

C H A P T E R VI

ADVANTAGES AND LIMITATIONS INHERENT IN THE PERSONNEL MANAGEMENT INFORMATION SYSTEM CONCEPT

I INTRODUCTION

> "The dual function of the personnel department concerns: people as an organization to achieve a communal end; and people as people with individual needs. Accomplishing these objectives or functions requires keeping a number of records and having a ready facility to analyze them in a variety of ways."

> "Facts are indeed the lifeblood of the personnel department, but quite clearly, record keeping is not its primary function. It is merely a necessary tool. Yet how often the department finds itself employing an army of clerks to do nothing but maintain and aggregate records about staff as individuals and as groups; how often the fundamental jobs fail to get tackled because of the sheer weight of recording work. We must therefore look to the computer to help the personnel department ant to take over much of the record keeping, to analyze the records in a far more comprehensive manner and to ensure that the data about the personnel field of the business is integrated with all the other elements to provide the raw material of decision making."[2]

Chapter 3 and Chapter 4 considered some of the specific actions which were required in order to establish a PMIS. These actions had to be considered in light of the environment of the economic system: that labour costs are rising; that there is increased competition for qualified employees;

that automation is introducing new personnel problems; that improved communication and transportation facilities have, along with other factors, greatly contributed to the increased mobility of employees; that old-fashioned techniques may be becoming inadequate in light of the preceding factors.

The preceding comments lend themselves naturally to a discussion of some of the advantages and limitations inherent in the basic concept of the personnel management information system. It must be kept in mind that many of the "advantages" and "limitations" per se may not be applicable or acceptable in every given situation. In other words the objectives and management methods of various firms are different and thus what may be advantageous to one company may not be to another.

II ADVANTAGES OF THE PMIS

There are numerous advantages offered in the personnel management information system. The following discussion initially centres on various general advantages, and will be followed by advantages to the functional areas of personnel administration.

Computer Characteristics

An examination of some of the characteristics of a computer may be helpful in setting a proper frame of reference. The computer cannot think, it must be instructed in the clearest

possible terms. It is not a "Big Brother" controlling people, but rather simply evaluates the facts which are presented to it, arriving at its answers by applying a series of questions to a wide range of data. The computer demands uniformity of input, thus forcing the users to rationalize their methods, to make their documentation and procedures more self-consistent. Computer usage is suggestive of the systems analysis approach, requiring users to examine the whole range of their activities; how and why things are done; who does them; on what time scale and so forth. A complete organization and methods review is involved so that a consistent and uniform flow of data may be available for the computer to process. In this procedure, not only are records being mechanized, but the computer is being harnessed to yield a more sophisticated business life.

General Advantages

The decentralized or geographically dispersed firm could obtain much benefit from the PMIS, as it will bring the company closer together. However, some means of communication must be employed; the use of terminal outlets is the most efficient but also the most expensive.

The size of the company, at the present time an important factor due to the high costs associated with computers, is becoming less important as many firms, through time-sharing facilities may utilize the same computer. Size however is a factor, apart from the cost aspect, as it is apparent that

many of the advantages of EDP would not be realized by a firm employing a small number of employees. It is generally assumed that companies with large work forces will derive larger benefits as all the employees cannot possibly be known by any single administrator. The nature of the company's business may also be a factor. A large multi-plant firm with several sizeable government contracts may create new positions or call for large labour cutbacks as contracts are received and completed. Large numbers of employees would have to be shifted among various plants to balance the needs of the firm. In these computer reports and procedures could substantially aid the decision-maker in the determination of those employees who are to be laid off, rehired, or moved to a new location.

How does the individual fare when his personal data is fed into a computer, does he become a faceless number? Experience has shown the contrary, that the employee benefits, and measures are generally taken to "sell" the employee on these benefits before such a system is implemented. In general, little more information is held on the employee when the records become computerized than when they were kept manually (with the exception of extra data gathered for the skills inventory). The only major difference between the old and new systems is the physical medium on which the data is held and the fact that all this data is centrally stored. Instead of cards or forms the storage medium becomes computer disc or magnetic tape. The major advantage resulting from computer-

ization is that now much more can be done with the employees' data than was previously the case.

Employees are told that their chances for promotion are more fair and equitable under such a system, as they are now automatically considered for any opening which may develop anywhere within the firm. Within this "skills inventory" concept, the employees are assured that the employer has a thorough knowledge of what he can do, and thus hopefully will be left with the impression that the company cares more about him as an individual. One extra advantage accrues to the employee by having his statistics placed on the computer: he receives an annual printout of his employee file, and can update this or make any changes he sees fit, return it for recoding or correction, and he assured that the company has proper and correct information on him. Such procedures were never done when using manual personnel systems.

The role of the individual manager may be changed to a degree with the advent of a personnel management information system. Chapter V highlighted the extent to which the computer can assist the manager in his day to day decisions through the notification type reports which give him prior warning of actions to be taken in the future regarding employees. The numerous government reports required can become much easier once the computer is programmed to produce the required information on demand. The amount of information made available to the manager, as long as it does not become excessively voluminous,

is a great aid to communication within the organization, in that the key men are made more aware of what is going on.

EDP and Bookkeeping

One major advantage of EDP in the personnel department is the effect on the bookkeeping aspect of personnel records. Employees who were being underutilized by processing large amounts of data manually are now freed to concentrate their efforts on other aspects of personnel work, to become more knowledgeable about information held in the files rather than concentrating efforts on the completeness of the information or the physical location of the file. Duplication of information held on records throughout the firm is eliminated if the various functions of the personnel system are integrated with the payroll system. The files are stored in a single location and are available to any request for information anywhere in the firm as the need arises. A clear mechanism exists to change and correct files to keep them properly updated as a result of the initial systems analysis of the personnel functions.

Special requests can be answered in a fraction of the time it takes to complete a similar procedure manually: for example a firm of 10,000 employees may wish to determine the names of employees with over five years experience who have taken outside courses in management training, a very time consuming job under manual conditions but requiring very little

computer time.

One obvious clerical advantage is reflected by the multitude of uses (utilizing innumerable subroutines) that can be obtained from the single personnel file, as illustrated in Chapter V. At the present time, it is a fairly safe estimate that for companies not employing EDP, much of the information held on personnel files is not utilized simply because the clerical labour required to perform these functions is excessive.

The preceding comments illustrate two attributes offered by personnel management information systems: increased flexibility and scope. Flexibility is increased, for once the system is designed to meet broad objectives it provides a sound base to offer management practically any information it may need in the future, providing of course that the system was designed with the prerequisite data initially installed in the data bank. Scope is similarly increased. The personnel department is able to afford the firm far more personnel services and itself learn more about their manpower variables than previously was the case.

Results of Surveys

Dr. Elizabeth Lanham has considered many aspects of computerized personnel systems.[3] The survey she referred to found several reasons why personnel departments employ EDP procedures: to expedite record and report preparation by

providing facts quickly, the result being improved quality and timeliness of data; to provide for rapid and accurate classification and reclassification of data; to establish systematic and efficient procedures; to provide more comprehensive data; to improve overall control; to permit cross comparisons of interdepartmental data; to reduce costs; and to improve long range planning.

The cost aspect should be examined in greater detail. The cost centers for EDP installations generally are: machine system; programming; man-hours on machines (i.e. EDP personnel); and selection and designing costs. Dr. Lanham found that one-half of the firms surveyed experienced cost reductions, a few found costs higher, while others found costs approximately the same. On the other hand, R. T. Bueschel commented that "the benefit of data processing in Personnel seems to be largely intangible values, not direct dollar savings." [4] He argues that few personnel departments have really a clear idea of their costs, either before or after EDP installation is made. Irregardless of either side of this argument, it should be kept in mind that cost comparisons may be an unacceptable criterion in the evaluation of EDP for the personnel department. The increased flexibility and scope offered by the EDP installation include services that did not exist prior to the installation, consequently the post-EDP advantages are difficult to relate in dollar terms to services which did not exist previously.

Dr. Lanham reported some advantages recorded by the larger firms employing EDP for personnel work. Among these advantages were: improved payroll accounting; speeded up handling of personnel information; less expensive and more accurate personnel records and reports; uniformity of data input; and better managerial decisions on personnel matters.

U. S. Civil Service Commission Program

The Civil Service Commission's (USA) Executive Assignment System, considered in the previous chapter, has reported many advantages offered by this system. It was designed in part, to enable the Civil Service Commission (CSC) to make better forecasts of manpower needs and supplies, thus making possible more and better executive manpower planning. By centralizing all the data of top Federal employees in Washington it is hoped that widened opportunity for growth and advancement will exist for executives located in relatively isolated areas who will thus receive consideration for jobs in other agencies as they arise.

The United States federal government is not a "status quo" organization. It must have up to date information on employees in the event of a new agency being created, an older agency being reorganized, or where mobilization may be necessary. In the words of President Johnson: "This new system will tell us whom we need and where they are. It will provide us with

the flexibility to bring the right talent to the right job at the right time." [5]

Under the Executive Assignment System, the government benefits through more efficient use of its top management; the public servants benefit from increased opportunities for their career development and increased satisfaction; the citizens benefit from better administered programs which provide them full value for their tax dollar. By employing EDP methods, the US Government has brought modern manpower methods to the task of locating, developing, and utilizing the best executive talent available for the key posts throughout the executive branch.

One major environmental factor indicated to the CSC a need for better manpower management techniques: the demand for good executives was increasing sharply, exceeding the supply, thus new and better procedures were required. The preceding comments illustrate some of the reasoning behind the Civil Service Commission's move to employ EDP for their top management, and certainly much of this reasoning can be applied to the average corporation.

Advantages to Various Personnel Functions

Discussion at this point turns to the advantages offered in the PMIS to the various basic functions of the personnel department: records and administration; staffing and

recruiting; training; wage and salary administration; manpower planning, and collective bargaining.

Personnel Records and Administration. Personnel records and administration are the obvious points to begin consideration of a personnel management information system. Computerizing basic records, for all functions, results in more timely and significant information being produced, while at the same time reducing clerical labour. Quality of input information is controlled by the personnel department to ensure accuracy and completeness. The information held in the data bank is updated as changes occur through the use of properly designed input forms, as described previously. The input information is recorded once, and all output reports are derived from the one Master File. The many built-in checks on the information help to ensure accuracy of data results.

Staffing and Recruiting. The staffing and recruiting functions are greatly assisted by the manpower data bank. Staffing has to a certain degree been considered in the discussion of the program of the U.S. Civil Service Commission. The decision to get the right man into the right position cannot be made hurriedly, but must be rapid. Old methods apparently are inadequate in large companies, where the process generally includes a review of the college specialty and all file folders before interviews are carried out.[6] When automated selection techniques are employed however, areas of interest and fields

of specialization are isolated. Much clerical work is saved as the employee's data have been coded for abilities and areas of proficiency.

The "skills search" of the manpower data bank is comprehensive and quickly presents a list of suitably qualified candidates. If this resulting list is too long or too short, the constraints on the search can be increased or relaxed. This selection procedure better coincides with talents and previous interests of the individual, thus fewer training and job familiarization requirements have to be met.

The skills printout report also has certain other advantages to the manager: in an examination of the workforce for special job assignments; in the preparation of proposals for projects he has a good idea of his available manpower; in the reorganization of operations; in career counselling; and finally in just plain knowing his people. [7]

The concept of the skills inventory is synonymous with the following: promotion from within; efficient use of talent; fast and easy location of vitally needed or unusual skills; and concerned management. The inventory program aids management in identifying talent, developing talent, and pinpointing hiring needs. A system of this nature puts an onus on personnel management to ensure that files are continually updated.

Companies which may best make use of skills inventories are characterized by: complex operations requiring a wide range of managerial, technical and administrative skills; those whose divisions are geographically dispersed; and those companies whose contracting work would require that they be able to show to customers and clients that they have the necessary skills and managerial and technical capabilities to do the job.[8]

A properly designed skills inventory program, coupled to modern staffing techniques results in a job vacancy in one area being immediatly known in other company divisions so that good employees are not laid off or fail to find employment in one area when the company can use their skills in another area.

Related to the staffing considerations is the recruiting function, another aspect of personnel work which is adaptable to EDP procedures.

> "In diversified, decentralized companies with many geographically distant and semi-autonomous components, striking the right balance between coordinated and independent recruiting is a necessity. Where recruiting has been uncoordinated it has not been uncommon to find two adjacent and related components simultaneously recruiting the same man."[9]

As a result of uncoordinated recruiting efforts, many companies have found themselves in the curious position of unknowingly being in competition with themselves. Centralized computerized recruiting procedures are a major answer to this problem if a system has been properly designed to meet

the needs of the recruiting teams.

The heavy volume of employment enquiries means oversized paper problems, due in part to resumes which arrive in massive quantities during the recruiting season. Prompt response to these applications is essential for proper recruiting as well as for public relations. At the same time it is virtually impossible for a small staff to keep updated on every application file. However at the same time it is essential that the existing current analysis of recruiting activity at any one point in time be known in order to plan further activity.

A properly designed computerized recruiting system affords the following: notification to applicants of their status; personnel department awareness of the aggregate skills of the applicants; paper work and thus worry reduced to allow the recruiting team to function more smoothly.

Training. Firms have found it advantageous to automate their training records.[10] A great deal of time may be spent by the training department collecting and reducing data, typing completion notices, filing, compiling statistics, and writing routine reports and special "immediate" reports. These functions are necessary, but may become large and disorganized.

Integration of the training function into the Personnel Management Information System brings obvious advantages.

Special reports and data can be provided more accurately and easier. As more and more training and pertinent job data is stored in the data bank the training department is better able to evaluate its training programs through research and analysis programs which were previously impossible.

Wage and Salary Administration. As mentioned before, the payroll function is generally the first stage of the PMIS to be implemented for firms using the computer. The advantages of this application are obvious. Wage and Salary Administration is closely related to the payroll function, and can also derive much use from EDP procedures.[11]

As the PMIS is integrated with the payroll function the data bank contains much relevant information for use by Wage and Salary Administration people. Also, for analysis purposes, external salary survey data can be "read" into the computer so that the firm can better evaluate its competitive position and assess the strengths and weaknesses of its own programs.

If the wage levels are lower than average, the firm may lose good men to higher paying companies; if on the other hand it is paying wages much higher than average, the excess represents an unnecessary expense. In effect, the computer will aid the firm in optimizing its wage and salary schedule.

Wage and salary data may be simulated in order to obtain a projection of this portion of the corporation's expenses at a future point in time. The impact and potential cost of a

general salary increase can be predicted beforehand, and thus may be related directly to the assessment of collective bargaining implications of alternate proposals.

While the average firm will welcome outside wage and salary data, it nevertheless will occasionally be called upon to provide data to other sources. Computer procedures may be able to accomplish this much more efficiently for the wage and salary administration department.

Manpower Planning. The manpower data bank is a useful tool in manpower planning, in that it aids in the determination of future manpower requirements.[12] Utilizing EDP, the manpower planning function may be closely tied in with the other long range planning activities of the corporation, thus allowing corporate planners to ensure that an adequate supply of skilled manpower will exist to meet future needs.

Integration of the Personnel Functions. Much of the reference literature utilized for this chapter has explained how various aspects of the personnel function can be adapted for computerization. However, very little if any literature exists to explain how all the separate functions can be integrated through a common data bank to optimize personnel operations. While this would seem to be a natural consequence, there was no evidence that any firm has automated all aspects of the personnel function.

This point is mentioned here because it is felt that if certain benefits accrue to partial utilization of computer facilities, then large benefits would result if all functions were computerized within an integrated, fully coordinated system. To a large extent the model of Chapter IV dealt with the integrated system concept, indicating nevertheless how component parts of the whole could be considered separately.

III LIMITATIONS OF EDP IN THE PERSONNEL DEPARTMENT

Some of the concepts involved in the previous consideration of personnel management information systems are somewhat limited. The following comments are intended to illustrate some of these limitations.

Company Characteristics

When computer time is at a premium owing to a lack of adequate facilities, as often is the case, the personnel department is usually given a low priority position when this scarce computer up-time is being allocated. This may be explained by an earlier comment that the personnel department has difficulty in justifying in economic terms a PMIS, whereas advantages to other areas of corporate operations may be more obviously related to dollar savings.

There are certain types of companies to which adaptation to computerized personnel systems would be of little real advantage. Small, centralized companies are a case in point,

where the manager generally knows all his employees and is in day to day contact with them. Record keeping facilities in such circumstances are kept centralized and simple. Other personnel functions such as payroll, training, manpower planning and recruiting may be greatly simplified to serve their narrow purposes. Companies which exist only on a seasonal basis, or employ a proportionally large number of temporary (part-time) workers would find little advantage to such a system. In general, the type of firms most advantageously employing EDP are large corporations or research and development firms where the employee is the key resource.

Elizabeth Lanham listed some problems encountered by firms who have implemented computerized personnel data banks. Some firms had difficulty in obtaining accuracy in the input information due to improperly designed checking procedures. Another problem was the difficulty encountered by firms who improperly foresaw their requirements with respect to records and reports and planning in advance for them. [13] Other problem areas included the actual changeover from manual records to the EDP system, and the coordination required between the personnel department and the computing center. Programming, designing records and reports, and tailoring EDP equipment to fit personnel department needs were also listed.

These considerations listed above have in general indicated a problem common to any EDP installation; that of the need for qualified personnel to design and implement the system

It may prove more advantageous for firms to turn to outside specialists in the field rather than attempt to implement such a system using their own personnel. The firm's personnel may take longer and do an incomplete or inadequate job in comparison to the specialists who would realize the problems at the outset, not after the job has been completed.

Robert Martin has considered some of the prerequisite procedures for the proper implementation of the skills register.[14] One limitation appears to be that quantity of work (as measured by years of experience) does not truly represent quality of work. Tests may be given to the employees to measure aptitude and intelligence but tests cannot effectively measure dedication, loyalty, energy and drive etc. Language may be a problem; the different viewpoints of terminology may cause a breakdown in the employee search. The employee who fancies himself as a custodial engineer but who is classified by the coding analyst as a janitor may be overlooked when a request is made for a floor sweeper. These problems again may be overcome if skilled personnel design and implement the system.

Summary

This chapter has attempted to examine the main advantages and limitations of personnel management information systems. It must be concluded that if the characteristics of the firm

warrant it, the advantages to be gained far outweigh the disadvantages.

The computer can be an indispensable aid if the personnel department is being called upon by management to contribute directly to the company's profitability, and if its activities are being judged by objective comparisons between predetermined objectives and measured results.

> "If the personnel manager wants to be progressive, rather than for the status quo, he can, at the present, do little better than by living daily with the computer in the performance of his own detailed tasks."[15]

These comments must be kept in mind in the light of the fact that the full implications of the computer are not known at the present time. Future technological developments will undoubtedly change the role or the concept of the computer in relation to personnel work, in all probability facilitating the use of EDP by the personnel department.

1 Edgar Wille, The Computer in Personnel Work, (London: Institute of Personnel Management, 1966) p. 11.

2 Ibid p 12

3 Elizabeth Lanham, "EDP in the Personnel Department," Personnel (March-April 1967) p.17.

4 R. T. Bueschel, "EDP and Personnel," Management Bulletin 86, American Management Association, Personnel Division, 1966, p. 6.

5 John W. Macy Jr. "The Executive Assignment System" Civil Service Journal (October-December 1966) p.3.

6 Richard A. Kaumeyer, "Automated Skills Retrieval: One Company's Program" Personnel (Jan-Feb 1967) p. 16.

7 Ibid p. 20.

8 J. T. Wolcott, "How to Develop a Skills Inventory," Personnel, (May-June 1964) p. 55.

9 R. H. Hawk and G. A. Bassett, "EDP: A Management Recruiting Tool," Administrative Management (August 1965) p. 22.

10 Walter B. Wentz, "Time to Automate Your Training Records?" Personnel, (November-December 1960) p. 74.

11 R. T. Bueschel, "How EDP is Improving the Personnel Function," Personnel, (Sept-Oct 1964) p.61.

12 R. T. Bueschel, AMA Bulletin 86, op. cit. p. 11.

13 Lanham, op. cit. p. 21.

14 Robert Martin, "Skills Inventories," Personnel Journal, (January 1967). p. 28.

15 Wille, op. cit. p. 28.

C H A P T E R VII

THE FUTURE FOR EDP IN PERSONNEL WORK

Discussion up to this point has centered upon the design of existing personnel management information systems and their inherent advantages. However the world of computers is presently in an era of extremely rapid growth, in both technical hardware and software applications employed. The implications for the future are unlimited. This chapter is presented to give the reader some idea of what the future may hold in store for personnel management.

I TECHNOLOGICAL FACTORS

Technologically speaking, computers of today are in the so-called Third Computer Generation.. Each "generation" represents a level of increased sophistication of computer hardware and software. Much literature exists on the present abilities of various computer systems consequently they will not be dealt with here.

The fourth generation of computers represents the next step in sophistication. It should be characterized by a significant simplification of systems and programming analysis, increased reliability and flexibility, and confidentiality.[1]

It will extend the vital decision making process to include top management planning and decision-making, with the resulting benefit of sharpening the vital elements of the organization. On-line computer terminals, in limited usage today, should become commonplace devices to handle much of the computer's work through direct input and retrieval procedures.

Many existing computer applications will undoubtedly be outmoded by future improvements. One case in point is the direct document reading procedures which may render obsolete the personnel required to keypunch cards for input to the computer.

II EFFECT UPON MANAGEMENT

The personnel manager of the future should operate in a totally new environment as a result of the EDP procedures he will employ. Hopefully, his new environment has been aptly described in Chapters III, IV and V of this thesis. For example, Bueschel estimates that future applications will expand the system to handle regular employment applicants.[2] Also planned are: report generators for analysis of salary curves; analysis of skills within the firm; manpower planning studies, and many other personnel reports.

Technological improvements should allow continuous updating and recording of the employee's place of work and better utilization of the work force in daily operations. These

improvements should be felt in better attendance and work station records.

In employment, complete information should exist on the whereabouts and status of all applicants being considered for employment. Data will be gathered to provide essential information useful in planning and advertising programs, out of town recruiting, and budget programs. Strategic information should be easily gathered and analyzed on: what motivated employees to join the firm; the characteristics they possess; the skills hardest to find and hence what training is required. This information should be available to recruiters on a real-time retrieval basis.

When the line manager needs file information on an employee he will dial the computer and through a code state the type of information he desires. Clerks will be able to deliver the printouts within minutes. Such communications can be controlled through the use of identification numbers, thus eliminating any indiscriminate use of the facilities by unauthorized personnel. The printer may be stored in the personnel department for security reasons as well as economy.

Through the use of the EDP network, forward planning by personnel departments will be accelerated, because personnel managers will have more information and opportunity to participate in top management decisions that affect the future planning of the corporation. Personnel managers of the future

will have to adapt to the changes inherent in the PMIS, and will be better managers if they can.

The concept of the company may alter in the future, as a result of EDP practices and procedures. Many companies may accept the fact of the total business information system; the board of directors may decree that all aspects of the corporate entity be included. If so, the personnel department would find that it is to be included in the EDP operation. The major benefit of such a policy would be that the personnel department would not have to compete as a low priority department for computer time, as adequate facilities and personnel would be allocated to it.

Elizabeth Lanham has reported that although many organizations do at the present time have EDP equipment and trained EDP specialists and are utilizing both in a number of phases of their operations, many have still not implemented EDP in their personnel department. [3] She concluded that there was much evidence to indicate that there was an increasing awareness of the advantages of the computer in personnel work and consequently the future will see many more firms using it.

For those companies presently using computers in the personnel department, future use may expand along two lines: the number of personnel functions computerized and the types of employees included in the manpower data bank. An earlier chapter indicated that not all areas of the personnel were

computerized, that there was a so-called hierarchy of priority in computerizing the various functions. Still other comments indicated that for any given firm or group, not all employees were initially considered, i.e. initially some firms computerized only the data on its upper management and technical people. In the future it therefore would be expected that the computer facilities for personnel use will be expanded to include all functional personnel areas, and also all employees within the organization.

As these sophisticated techniques are implemented, the average firm would be expected to become less and less decentralized in its personnel function. Similarly for other corporate functions the role of the computer is also expected to lead to a trend towards centralization of functions. This aspect could conceivably mark the entrance into a new era of management concepts and become the target of much new work by students of management organization and philosophy.

The future success of the PMIS concept depends to a large extent upon the environment provided by both top management and society.[4] Society must realize the benefits and not become unnecessarily preoccupied with the "Big Brother" fear. For management, high level competency in systems design and computer programming will be required, as well as a willingness to change local ways for company good. Long term heavy investment is also required. As system sophistication increases, rigorous

analysis of top management functions coupled with business research will be necessitated.

Many of the concepts embodied in the PMIS discussion may eventually be utilized to society's advantage in organizations external to the firm in the future. One writer envisions the need for a sort of "Federal Reserve" system between firms to aid one company seeking employees while other firms are going through a labour force reduction. [5] If information was centralized the companies would benefit, the employees would benefit, and the nation's manpower resources could be better utilized. Schon proposes a similar scheme whereby large employers in key districts would be a major source of input information for "technological forecasting" or "national manpower planning." [6]

Bueschel has foreseen for the future the need of a new type of firm known as a Personnel Utility. [7] The Personnel Utilities would offer personnel services to the corporations in packages that might be time-shared among the personnel departments of several companies. Access would be gained through terminal devices located in offices of remotely located users. The Personnel Utility would offer special services such as the availability of a highly skilled wage and salary analyst.

The concept of the Personnel Utility is greatly enhanced upon an examination of the advantages of defraying the costs over a large number of companies. It is cheaper to buy certain

computer services outside the company since the development and computer costs are spread over a wider base. The data processing staff could also be shared. Bueschel concluded that "it is reasonable to predict that time shared utilities will offer personnel applications packages within the next several years."

As of 1968, the exposure of EDP to the personnel is still recent, but the trend is toward a strong effort to make up for lost time. These trends will be reflected in future developments that will undoubtedly be unheard of today. Projections suggest applications that will facilitate better forward planning and closer ties with the total company system. These are the changes of the future.

1 Edward A. Tomeski, "Personnel and Software: Third Generation EDP Dilemmas," Administrative Management (March 1967) p. 16.

2 R. T. Bueschel, "EDP and Personnel," Management Bulletin 86, American Management Association, Personnel Division, 1966, p.8.

3 Elizabeth Lanham, "EDP in the Personnel Department," Personnel (March-April 1967), p. 22.

4 Tomeski, op cit p. 17.

5 Richard A. Kaumeyer, "Automated Skills Retrieval: One Company's Program," Personnel (Jan-Feb 1967) p. 20.

6 Donald Schon, "The Role of the Government in Technological Forecasting" A Report to the President's Committee on Manpower, January 1966 p. 8.

C H A P T E R VIII

CONCLUSIONS

This thesis has attempted to present a generalized, comprehensive picture of all aspects of Personnel Management Information Systems. It has examined their content at the present, proposed an idealistic model, and looked toward the future.

At the present time, the majority of firms examined have not utilized EDP in their personnel departments to the fullest extent. However it must be kept in mind that the corporation must deal with the hard economic facts of computer applications, a constraint that was "relaxed" to a certain degree in this presentation.

The model presented earlier was obviously idealistic, but nevertheless it represents certain goals to which the organization computerizing its personnel functions might strive. The systems analysis approach plays a very large role in the optimum design of the PMIS, as it represents a thorough and systematic approach to the analysis and solution of the problems to be faced. The potential uses to be gained from the manpower data bank are almost unlimited, providing the prerequisite information has been "deposited" in it.

The advantages and limitations of computerized personnel system were discussed in some detail. In general, at the present time, it was concluded that for a properly designed system, the advantages far outweigh the disadvantages, thus providing incentive for further work in this area.

The future for personnel information systems appears to be very bright. The model presented in this thesis probably represents only the initial stages of ultra-sophisticated systems to come. The technology of computer systems is changing so rapidly that it is not possible to estimate some of the facilities which will be available in ten to twenty years from now, yet the PMIS is of course closely related to technological (and thus economical) developments.

Much more work remains to be done in this area by students in the personnel field. More work can be done on meaningful research procedures to make better use of the manpower data bank and thus gain more knowledge of employees' characteristics. While it was initially hoped to simulate a model of the PMIS on the computer, it was found that the many complexities of the personnel function, along with a prohibitive amount of programming work, made this nearly impossible. It may be worthwhile at some point however to "borrow" the manpower files and policies of a small firm and attempt a model for them. Work is also needed in the examination of the potential abuses of such systems if they are not adequately safeguarded from those

who would misuse them.

Good decisions require timely, meaningful and appropriate information. The personnel management information system provides a flow of information to satisfy management's needs. It is a base for systematic management, an orderly approach to the performance of the management role. The system facilitates the exercise of judgement, but does not replace it, since judgement and intuition remain significant elements in the decision process.

B I B L I O G R A P H Y

A. BOOKS

Arnold, Robert R., Harold C. Hill and Aylmer V. Nichols. Introduction to Data Processing. New York: John Wiley and Sons, 1966. 326 pp.

Becker, Joseph, and Robert M. Hayes. Information Storage and Retrieval: Tools, Elements, Theories. New York: John Wiley and Sons, 1966. 448 pp.

Durham, William. Personnel Records, Forms and Procedures. London: The Industrial Society, 1961. 85 pp.

Luck, T. J. Personnel Audit and Appraisal. New York: McGraw Hill, 1955. 405 pp.

Toedt, T.A., et al. Managing Manpower in the Industrial Environment. Dubuque, Iowa: W.C. Brown Publishers, 1962. 376 pp.

Yoder, Dale, et al. Handbook of Personnel Management and Labor Relations. New York: McGraw-Hill Book Company, 1958.

B. PERIODICALS

Bailes, Stephen M. "Fundamental Aspects of Establishing A Skills Inventory," Personnel Journal (1962) p. 226-230.

Bueschel, R. T. "How EDP is Improving the Personnel Function," Personnel, (Sept-Oct 1964) p. 59-64.

Esser, N.J. "The Computer - A Challenge to the Personnel Function," Personnel Journal, (June 1965) 292-94.

Hawk, R. H., and Bassett, G. A. "EDP: A Management Recruiting Tool," Administrative Management, (August 1965), p. 22-24.

Kaumeyer, Richard A. "Automated Skills Retrieval," Personnel, (Jan-Feb 1967), p.16-20.

Lanham, Elizabeth. "EDP in the Personnel Department," Personnel, (March-April 1967), p. 16-22.

Macy, John W. "The Executive Assignment System," Civil Service Journal, (Oct - Dec 1966), p.1-7.

Martin, Robert A. "Skills Inventories," Personnel Journal, (January 1967), p. 28-30.

Rabourn, Owen N. James H. Schilz, and Charles W. Holland. "A Successful Selection Technique," Personnel Journal (April 1967), p.211-13.

Rosenbaum, Bernard L. "The Manpower Inventory - A Powerful Tool," Personnel Journal (Feb. 1967) p.85-87.

Tomeski, Edward A. "Personnel and Software: Third Generation EDP Dilemmas," Administrative Management, (March 1967), p. 16-18.

Wentz, W. B. "Time to Automate Your Training Records?" Personnel, (Nov-Dec 1960), p. 74-78.

Wolcott, J. T. "How to Develop a Skills Inventory," Personnel, (May-June 1964), p. 54-58.

C. PUBLICATIONS OF GOVERNMENTS, LEARNED SOCIETIES, AND OTHERS

Bueschel, R. T. "EDP and Personnel," Management Bulletine 86, Personnel Division, American Management Association, 1966.

Dickmann, Robert A., Olinda Elliott, and Leslie A Hubbard "Information Retrieval in the Personnel Department" The Johns Hopkins University, Maryland.

Gaylord, Richard H., Alfred J. Farina, Paul Spector. "Operational Analyses of the Naval Personnel System: Part I. Development of a Personnel System Model" Final Report, American Institute for Research, (December 1959).

Gaylord, Richard H. and W. J. Knetz. "Operational Analyses of the Naval Personnel System: Part II." Final Report American Institute for Research, (1961).

Giesler, E. B. "Manpower Planning: An Emerging Staff Function," Management Bulletin 101, Personnel Division, American Management Association, 1967.

Gorham, William. "An application of a network Flow Model to Personnel Planning" U.S. Air Force Project Rand, Rand Corporation, June 1960.

Gorham, William. "Some Analytical Techniques for Personnel Planning," U.S. Air Force Project Rand, Rand Corporation, May 1960.

National Industrial Conference Board. "Forms and Records in Personnel Administration, No.175." New York: National Industrial Conference Board, 1960.

Wille, Edgar. "The Computer in Personnel Work." London: The Institute of Personnel Management, 1966.

D. UNPUBLISHED MATERIALS

Bowman, Raymond T. "A Federal Statistical Data Center: Interpretation of the Idea and the Criticisms It Has Evoked" (paper presented at the Fourth Annual Conference of the Council of Social Science Data Archives at the University of California at Los Angeles - June 15, 1967.

Executive Assignment System, "Executive Inventory Record" Bureau of Executive Manpower, United States Civil Service Commission, May 1967.

Executive Assignment System, "The Executive Inventory" Bureau of Executive Manpower, United States Civil Service Commission, May 1967.

Drexel, Charles A. "Highlights of Payroll Accounting on EDP," (paper presented to National Conference of Gas and Electric Utility Accountants, Cincinnati, Ohio, April 1964).

Farr, U. J. "EDP Record Keeping for Employee Thrift Plan - Unit Method" (paper presented to National Conference of Gas and Electric Utility Accounts, Cincinnati, Ohio, April 1964).

Johnson, Robert L. "Systematic Management - A Discussion of Systems Use in Management." (paper prepared for 1967 Management Conference Maschinefabrik Oerlikon at Stanford Research Institute, Menlo Park, California.

IBM Data Processing Application Manual E20-0035-0, "Personnel Skills Inventory" IBM, White Plains, New York, 1967.

IBM Data Processing Application Manual E-20-0273-0, "Centralized Personnel Records for Hourly Employees" IBM, White Plains, New York, 1967.

IBM Data Processing Application Manual E20-0193-0, "Personnel Data System," IBM, White Plains, New York, 1967.

IBM Data Processing Application Manual E20-8032, "General Information Manual - Personnel Records," IBM, White Plains, New York, 1967.

Meyers, Eugene D., "Integrated Personnel Record Keeping Systems - Columbus and Southern Ohio Electric Company," (paper presented at National Conference of Electric and Gas Utility Accountants, New Orleans, May 2-4, 1966).

National Aeronautics and Space Administration. "Data Processing Manual - Personnel Management Information System" NASA, Washington DC, 1967.

Simmons, Douglas L. "EDP Integration of Personnel-Payroll Records at Tennessee Gas," (paper presented at National Conference of Electric and Gas Utility Accountants, New Orleans, May 2-4, 1966).

A P P E N D I X

APPENDIX A

PERSONNEL MANAGEMENT INFORMATION SYSTEMS

(enclosed in pocket of thesis)

APPENDIX B

POSSIBLE DATA FOR THE MANPOWER DATA BANK

1. Identification Data

Full name
Mr./Mrs./Miss
Maiden Name
Address
Telephone number
Date of Birth
Age
Social Security Number
Employee Number
Nationality
Racial Origin
Birthplace
Marital Status
Dependents
next of kin
emergency notification
religion
nickname
name of spouse
name of supervisor
citizenship
colour eyes
colour hair
relatives in company
friends in company
when available

2. Education Data

Elementary School
Secondary School
Technical School
Vocational School
University undergrad
Master Degree
Doctorate
Grade average
Year of graduation
Apprenticeship
Correspondence Courses
Professional bodies
military training
night school courses
company courses
self-improvement activity
publications
languages spoken
secretarial
computer systems
first aid
teaching

3. Job Experience

Previous employers
Position when left
Wage when left
Date Started
Date Terminated
Reason for Termination
Category (full time etc.)
Company division
Immediate Supervisor
- name
- address
- position
- phone No.

responsibilities
nature of job
references
willing to travel
position desired

4. Payroll

Employee number
Occupation
Absentee record
Trade Union
Salary/Wage
Tax code
Pension plan
Loans
Expense Account
Exempt Status
Overtime Status

Group Insurance
Medical Plan
Bank Accounts
Seniority level
Vacation allowance
community service
sales bonus
land purchase
stock option
profit sharing

5. Job History and Appraisal

jobs held
rate of pay - beginning
- ending
seniority
place of employment
work schedule
time in position
outstanding characteristics
time under appraiser
supervisor comments

ability
character
conduct
accuracy
loyalty
cooperation
honesty
sobriety
rehire

6. Termination

Reason for termination	Remarks
Date of termination	length of service
Employee rating	

7. Medical

General health	X-ray report
height	MSA
weight	accidents - when
job limitations	- where
disabilities	- why
date of last medical	- whose fault?
date of this medical	
diseases	
BCHIS No.	

8. Testing

I.Q.	Interviewer's impression
psychological	
attitude	
aptitude	
manipulation	

9. Off-Job Activities

Service clubs	Community
professional clubs	church
union work	children's groups
hobbies	sports

10. Other

business telephone	employee grievances
managers approval	indoctrination procedure
driver's licence	tuition refund due
employee suggestions	

APPENDIX C

MANPOWER DATA BANK CODES

1. Types of Record Adjustment - Action Code

1. salary change	5. termination
2. addition to payroll	6. other
3. occupation change	7. marriage
4. location change	8. address

2. Type of Separation

1. voluntary	3. mutual
2. dismissal	4. other

3. Marital Status/Sex

1. male, single	6. female single
2. male, married	7. female married
3. male, widowed	8. female widowed
4. male, separated	9. female separated
5. male, divorced	10. female divorced

4. Absence, Reason

1. no reason	5. jury duty
2. illness	6. personal business
3. illness in family	7. transportation
4. death in family	8. other

5. Citizen Status

1. born in Canada	3. non-citizen
2. naturalized Canadian	4. applied for status

6. Education

1. elem. school credits
2. elem. school graduate
3. sec. school credits
4. sec. school graduate
5. college or univ. credits
6. college or univ. bachelor
7. college or univ. master
8. college or univ. doctor

7. Employment Reason (Nature)

1. replacement
2. addition
3. temporary
4. full time
5. part-time
6. special assignment
7. special consultant
8. summer student

8. Handicaps

1. no disability
2. partially blind
3. totally blind
4. partially deaf
5. totally deaf
6. single hand or arm
7. both hands or arms
8. single foot or leg
9. both feet or legs
10. general illness

9. Occupation

Some companies use the code laid out in the U.S. Government Publication "Dictionary of Occupational Titles" while many firms feel that their own code is more advantageous.

10. Occupation Status Reason

1. new employee
2. re-employed
3. returned from military service
4. temporary
5. transferred - promotion
6. transferred - demotion
7. transferred - personal reason
8. transferred - disability
9. other

11. Special Qualifications

1. no special qualification
2. large stature
3. medium stature
4. small stature
5. hands: large
6. hands: small
7. action: quick
8. acute hearing
9. acute sight
10. unusual dexterity

12. Termination Reasons

1. wages discontent
2. opportunity elsewhere
3. working conditions
4. personal (family)
5. health
6. unsatisfactory work
7. company rule
8. military service
9. dislike of work
10. pregnancy
11. to further education
12. trouble with supervisor
13. marriage
14. to reside elsewhere
15. discharged
16. layed off
17. retirement
18. deceased
19. dislike of locality

13. Wage Base

1. hourly
2. weekly
3. semi monthly
4. monthly

14. Wage Change Reason

1. probation rate
2. qualifying rate
3. seniority
4. merit
5. promotion
6. demotion
7. cost of living
8. general.

15. Reporting Installation

may wish to use say a 4 digit number. abcd

ab - province or area cd - plant level

16. Minority Group Code

1. North American Indian
2. Negro
3. Oriental
4. Spanish American
5. none of these
6. no response or unknown

17. Provinces

1. Alberta
2. British Columbia
3. Manitoba
4. New Brunswick
5. Newfoundland
6. Nova Scotia
7. Ontario
8. Prince Edward Island
9. Quebec
10. Saskatchewan

18. Answer to Questions

1. noncommittal
2. yes
3. no

19. Layoff

1. temporary job
2. change of methods
3. lack of work

20. Discharged

1. misconduct
2. inadequate performance
3. intemperance
4. poor attitude
5. disobedience

21. Extracurricular activities at school

1. class or student government
2. athletics
3. committees
4. debating
5. drama
6. journalism
7. special clubs

22. Promotability code

1. poor
2. fair
3. average
4. good
5. excellent

23. Indoctrination procedure

1. company policies
2. safety
3. benefits available
4. job description

24. Area of residency

- attempt code here - similar to Zip Code for the province as a whole in order to pinpoint area that person lives in.
- may wish to do it by political boundaries.

25. Cause of accident

a. Faulty environment

1. hazardous arrangement
2. unsafe material and equipment
3. illumination
4. ventilation
5. moving machinery

b. Human element

1. physical and mental characteristics
2. knowledge and skill
3. attitudes

26. Job factors for wages

1. mental effort required
2. skills required
3. physical requirements
4. responsibility
5. working conditions

27. Induction Procedure Checklist

1. general work of department
2. company operations
3. explanation of job employee going to

4. what is expected
5. how will he be rated
6. safety - injuries
7. salary information
8. hours of work
9. vacation
10. lines of progression for future promotions
11. location of major facilities
12. questions?
13. who to go to with questions
14. introduction to trainer
15. medical appointment
16. CPP book signed
17. Income Tax form
18. patent form
19. staff club
20. credit union
21. map, fact card, etc.
22. welfare plan
23. retirement plan
24. introduction to working associates.

28. Fringe Benefits

1. extra payment for time worked
2. payments for time not worked
3. payments for employee security
4. nonproduction awards and bonuses
5. payment for employee services

each of above can be categorized further if need be.

29. Expense Account Items

1. food
2. travel
3. lodging
4. entertainment
5. equipment
6. contingencies

30. Languages Spoken

1. English
2. French
3. German
4. Russian
5. Spanish
6. Italian
7. Slovak
8. Japanese
9. Chinese
10. Hebrew
11. African dialects
12. other Asian languages
13. Portuguese
14. Other

31. Type of Job

1. labourer
2. production line
3. skilled worker (craftsman)
4. supervisor
5. staff specialist
6. executive
7. technical (professional)
8. other

32. Testing

here it would be desirable for each individual company to code the specific types of testing methods it employs, leaving room for new testing methods not yet developed.

33. Grievance Reasons

1. wages
2. supervision
3. seniority
4. layoffs + promotion
5. disciplinary
6. safety
7. health
8. collective bargaining

34. Grievance stages

1. first line supervisor
2. plant manager or general foreman
3. employees group representative
4. third party intervention
5. arbitration

35. Training Programs

1. job training
2. supervisory
3. apprenticeship
4. induction
5. sales
6. presupervisory
7. executive development
8. general education

36. Professional Associations

1. professional engineer
2. various Engineer societies
3. law
4. accounting
5. industrial relations
6. marketing
7. finance
8. operations research
9. forestry
10. agriculture
11. scientific
12. medical science
13. CMA
14. AMA

37. Treatment Required for Accident

1. ambulance
2. dressing
3. examination
4. home visit
5. hospital
6. operation
7. redressing
8. special
9. transfusion
10. X-ray

CARD NO 1 - PERSONAL DATA

DATA RECORDED:	CARD NO.	EMPLOYEE NUMBER	SOCIAL INSURANCE NUMBER	MR MRS MISS CODE	FIRST NAME	MIDDLE INITIAL	SURNAME	ADDRESS		
								STREET	CITY	PROVINCE CODE
COL. NOS.	1	2-6	7-15	16	17-28	29	30-42	43-62	63-78	79-80

CARD NO. 2 - PERSONAL DATA

CARD NO.	EMPLOYEE NUMBER	BIRTH DATE DAY/MO/YR	TELEPHONE NUMBER	NATIONALITY CODE	MARITAL STATUS CODE	NO. OF DEPENDENTS		NAME OF SPOUSE
						M	F	
1	2-6	7-12	13-22	23-24	25	26	27	28-40

CITIZENSHIP CODE	NEXT OF KIN EMERGENCY NOTIFICATION	RELIGION CODE	DATE BEGAN WORK	SPACE
41-42	43-70	71-72	73-78	79-80

CARD NO. 3 - EDUCATION AND TRAINING DATA

CARD NO	EMPLOYEE NUMBER	FORMAL EDUCATION						YEARS HIGH SCHOOL COMPLETED	VOCATIONAL COURSES
		BACHELOR DEGREE	YEAR OBTAINED	MASTERS DEGREE	YEAR OBTAINED	DOCTORAL DEGREE	YEAR OBTAINED		
1	2-6	7-10	11-12	13-16	17-18	19-22	23-24	25-26	27-30

APPRENTICESHIP CODE	CORRESPONDENCE COURSES			PROFESSIONAL ASSOCIATIONS		MILITARY SERVICE		LANGUAGE CODES
	CODE COURSE 1	CODE COURSE 2	CODE COURSE 3	P.A. CODE	P.A. CODE	WHEN	TYPE CODE	
31-32	33-34	35-36	37-38	39-40	41-42	43-44	45-46	47-50

COMPANY TRAINING COURSES						TESTING				SPACE
TYPE	WHEN	RESULT	TYPE	WHEN	RESULT	CODE TYPE	SCORE	CODE TYPE	SCORE	
51-54	55-58	59-60	61-64	65-68	69-70	71-72	73-74	75-76	77-78	79-80

CARD NO. 4 - PREVIOUS EMPLOYERS (REPEAT FOR EACH ONE)

CARD NO.	EMPLOYEE NUMBER	PREVIOUS EMPLOYER			EMPLOYMENT PERIOD		ANNUAL SALARY AT TERMINATION
		NAME	CITY	PROV. CODE	FROM	TO	
1	2-6	7-18	19-34	35-36	37-40	41-44	45-49

POSITION WHEN LEFT	RESPONSIBILITY CODE	NO. OF EMPLOYEES SUPERVISED	REASON FOR LEAVING CODE	SKILLS LEARNED OR UTILIZED AT THIS POSITION (CODE)			SPACE
50-59	60-61	62-66	67-68	69-70	71-72	73-74	75-80

CARD NO. 5 EMPLOYMENT DATA

CARD NO.	EMPLOYEE NUMBER	PRESENT JOB CODE	NAME OF PRESENT JOB	SENIORITY DATE	PRESENT JOB		WORK SCHEDULE CODE	TOTAL LENGTH OF SERVICE
					DATE STARTED	DATE FINISHED		
1	2-6	7-11	12-20	21-26	27-30	31-34	35	36-37

DATE OF LAST APPRAISAL	DATE OF LAST REVIEW	PROMOTABILITY CODE	UNION CODE	SKILLS CODES			JOB LOCATION CODE	SALARY OR WAGE RATE	SPACE
38-43	44-49	50	51-52	53-57	58-62	63-67	68-72	73-77	78-80

APPENDIX D

SOME EXAMPLES OF INPUT CARD LAYOUT

APPENDIX E

EXAMPLES OF TYPES OF MANPOWER RECORDS EMPLOYED

1. Job Analysis and description

   - job description and specification
   - employee specification
   - job breakdown sheet

2. Recruitment

   - staffing schedules
   - applicant appointments
   - application and registration forms

3. Selection and Placement

   - interviewers check list
   - employment history form
   - education history

4. Training

   - employee training record
   - training timetable
   - request for tuition refund

5. Wage and Salary Administration

   - application for salary increase
   - change of rate notice
   - job evaluation schedule

6. Personnel Rating

   - rating scales
   - employee rating record

7. Promotion, transfer and leave

- request for transfer
- notice of transfer
- notice of promotion

8. Employee services

- application for benefit association
- request for group life insurance
- authorization for deductions

9. Health and Safety

- attendance record
- accident report
- sickness, illness reports

10. Discipline and separation

- stop or termination notice
- notice of dismissal
- exit interview

11. Morale measurement and maintenance

- grievance report
- opinion questionnaire
- suggestion blanks

12. Collective Bargaining

- notice of arbitration
- collective agreement

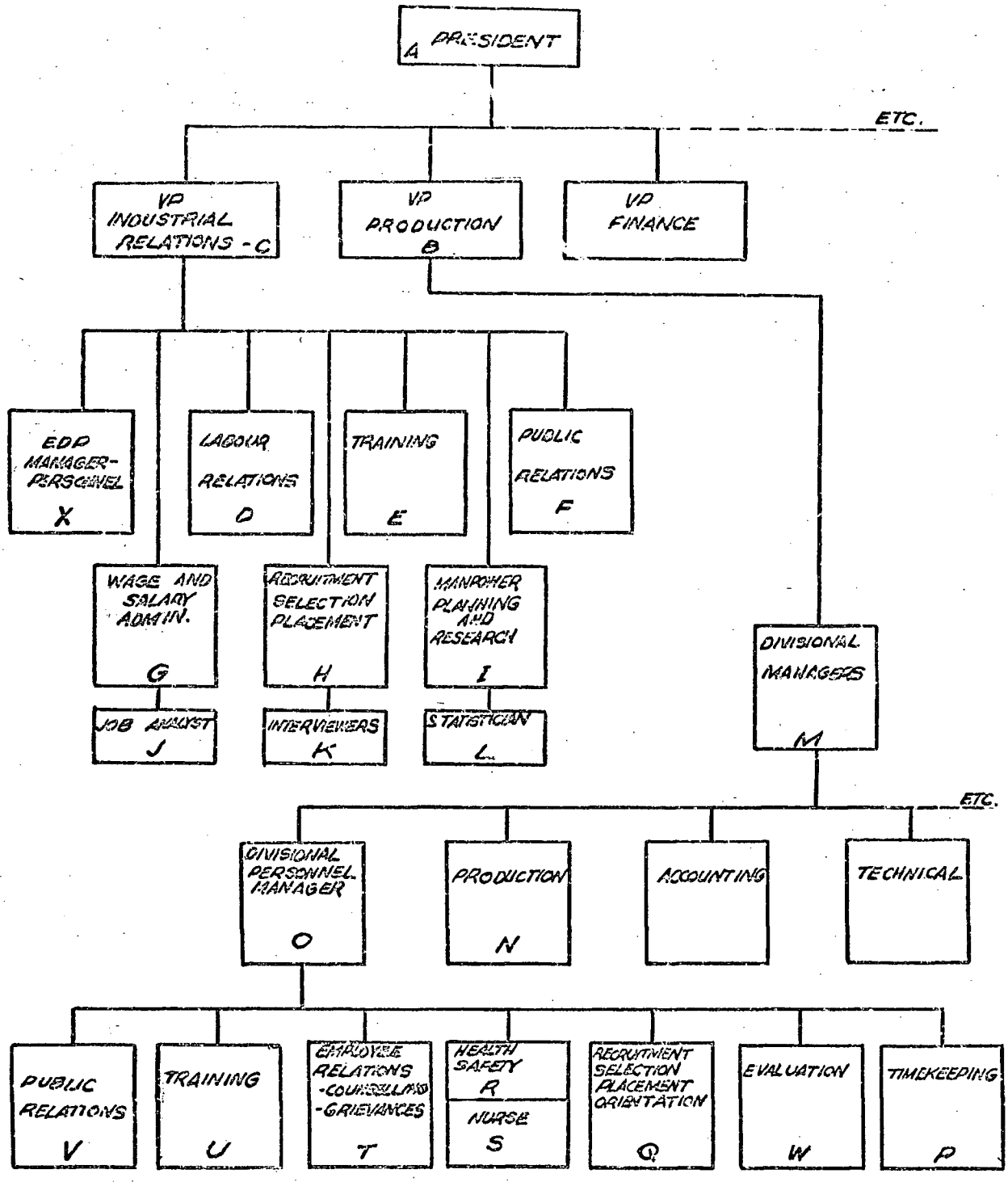
(source: Yoder p. 22-6)

APPENDIX F

EXAMPLES OF

TYPES OF ROUTINE REPORTING AND

RESEARCH AND ANALYSIS SUBROUTINES



APPENDIX F

ORGANIZATION CHART RELATING TO TABLE
ON THE FOLLOWING PAGES

No.	NAME	DESCRIPTION	RECEIVER	DATA REQUIRED
	THE COMPUTER REFERENCE NAME USED TO DESCRIBE THE PROGRAM	Type (i) company - action form (ii) company - research (iii) company - special requests (iv) company - routine reporting (v) government (vi) other (vii) internal computer procedures.	RECEIVER OF OUTPUT CODED ON PRECEDING ORGANIZATION CHART	
1	HAPPYBIRTHDAY	(i) employees listed with birthdays in near future	V	name, address, birthdate
2	MEDICHECK	(i) lists employees whose annual medical check due	R, S	Name, date, date of last medical
3	RETIRE	(i) lists employees whose retirement date imminent	V,Q,P,N other super	name, birthdate retirement code, date
4	RATINGDUE	(i) notification that employee rating due at specified date	Q,O,N	Name, date, date of last review
5	APPLICSTATUS	(i) notifies applicants of application status	Q, applicant	name, address, application status
6	ABSENTGEOG	(ii) analysis of absenteeism by geographic area	I, (H)	mandays absent, geographic location, total employees in this location

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
7	ABSENTDATE	(ii)	analysis of absentee rates by time period	I, (H)	mandays absent period involved
8	TERMINATION	(ii)	analysis of terminations by reason	E,I,O,T	termination code date left
9	TESTCHECK	(ii)	a program which would attempt to show quantitatively the results of company testing procedures on selection rates	I	work ratings test scores
10	SKILLCHECK	(ii)	examines employee inventory for special skills required	I	job codes skill codes
11	MARITAL-ABSENT	(ii)	looks at absentee rates by marital status	I	marital status mandays absent
12	ABSENT-REASON	(ii)	looks at absentee rates by reson given	I	reason-for-absenteeism code, mandays absent
13	SALARY-EDUCATION	(ii)	attempts to correlate annual wage rates with degree of education	I	education code salary level
14	SALARY-EXPERIENCE	(ii)	the correlation of annual wage rates with experience	I	experience in years salary level
15	LATE-REASON	(ii)	looks at lateness in reporting to work by reason	I	reason for lateness code hours lost

NO.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
16	SICKNESS	(iv)	looks at sickness reports by reason	R	sickness code No. people sick
17	QUALIFY	(iii)	skill-search of employee roster to find the man best fitting prerequisites	H	skills code skills desired
18	SALARY-CHECK	(iii)	complete salary distribution for all employees in the company	G, I	salaries No. in each range (coded)
19	COMMUNITY	(iii)	a listing of all employees and how they contribute to community affairs	F, I, V	code for extra-activities
20	SENIORITY-LIST	(iv)	listing of all employees by seniority and division etc. in order of seniority	M, N, O	name, seniority dates, occupation
21	CLUB-25	(iv)	lists all employees who have greater than 25 years seniority	F, V	name, occupation seniority date
22	EMPLOYEE-LIST	(iv)	alphabetical list of all employees by age and sex and by occupation groups	C, P, M, I	name, emp. No. age sex, occupation
23	MALESTATUS	(iv)	distribution of males by age and marital status, veteran status	O M C	age range - coded marital status-coded veteran status-coded
24	FEMSTATUS		same as 23 (iv)	O M C	age range - coded marital status veteran status

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
25	NEWSTATUS	(iv)	lists status changes for a given period	O M U	name No. old position new position date of change
26	TERM-PERIOD	(iv)	list of terminations for the period	T, Q, O, I	name, old position date left reason (code)
27	TRANSFERS	(iv)	list of transfers for the period	O, M, H	name, old position location, new position & location, reason
28	ABSENTEES	(iv)	list of absentee during the period	O, T	name, lost days reasons
29	MERIT-REPORT	(iv)	list of merit ratings of all employees	O, M, G	annual merit rating name, No.
30	SUGGESTION	(iv)	lists employee suggestion for period along with remuneration paid (iv)	O, M	name, No., suggestion remuneration estimated $ saving
31	EDUCATION-SUMMARY	(iv)	an overall look at the level of education in whole firm	I	education code occupation levels
32	EMPLOYEE	(iv)	complete history and data on the employee	O, HQ FILE,	all available data
33	ANNUAL	(iv)	annual alphabetical listing of all employees by address and telephone No.	M, N, O	name, nos., address telephone No.

No.	NAME	DESCRIPTION	RECEIVER	DATA REQUIRED
34	NEW-EMPLOYEE	(iv) lists all new accessions for the period	O, M, H	name, occupation date started
35	ACCIDENT	(iv) lists accidents, aid required, people involved during the period	R, O, M	name, No., occupation days on job, accident type (code) aid rq'd (code), lost time date of accident
36	TRAINING	(iv) lists training programs undertaken during the period by participant and type	O, U, E	name, date of training, type of training length of course location of program
37	HOSPITAL	(iv) group hospital payments made per period	P	
38	PENSION	(iv) pension payments made per period	P	
39	SAVINGS-BOND	(iv) savings bonds purchased per period	P	
40	EXEMPT	(iv) lists all employees by exempt status	P, O	name, No. exempt status
41	TRAIN-RECORD	(iv) lists recent training programs undertaken by all employees	U, E	name, training progs (code), date taken, results of course
42	AGE-ADD	(vii) updates age of all employees	b - none	age, date birthdate

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
43	UPDATE	(vii)	updating of master file with new data	none	relevant new data
44	DEADFILE	(vii)	to put date af employees who have left the company on a separate tape	none	employees who have left firm
45	SIMULATE	(ii)	given the model of the company simulate personnel operation	I	turnover rates accession rates termination rates promotions, transfers, job codes
46	REJECT	(iv)	letter to applicant to tell him his application was rejected	Q, H, applicant	reason (code?) name
47	INDUCTION	(i)	a procedure sent to the supervisor on the induction procedure to be followed for new employee	appropriate supervisor	induction procedure new job
48	APPLIC-INVENTORY	(iii)	printout of suitable applicants when positions become available	Q, H	name, address, phone No., type of work suited for
49	JOB-STANDARDS	(iii)	printout of prerequisite qualities desired for each position	U, Q, W, G	job names job resp (code)
50	TRAINING-NEEDS	(iii)	looks at employees abilities and compares them to the job he holds to determine training needs	O, U, E, M	employee strengths job requirements

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
51	SALARY	(iv)	monthly listing of salaries and wages paid to all employees, on cumulative basis	O, P, G	name, No., period salary paid, salary paid to date
52	FRINGE	(iv)	monthly listing of costs due to fringe benefits for the period, also cumulative for the various fringe benefits, using last 12 months figures		
53	PAYCHEQUE	(iv)	calculation of paycheque from accumulated data	employee, P, G	name, Nos., hours worked, pay rates fringe benefits deductions
54	EXPENSE-ACCT.	(iv)	monthly listing of all expense acct. charges	P, M	name, Nos. expense acct. charges
55	TUITION	(iv)	yearly listing of all pay-out to employees as tuition charges	F, U, E	name, Nos., course mark cost
56	ACCIDENT-YEAR	(ii)	yearly listing of all accidents by categories and costs	I, R, E	accident (code) associated costs
57	DISABILITY	(ii)	lists all employees by certain disabilities	R, E, U	name, No., position disability (code)
58	LANGUAGE	(ii)	examines all employees in firm with ability to speak other languages	I	name, No. job location languages spoken

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
59	MANHOURS	(ii)	total value of sales & prod. for the period vs. total manhours worked to get productivity	B M N	sales stats prod stats manhours worked
60	MANPOWER	(ii)	to forecast manpower needs given certain information about future operations	C, I	many variables
61	TURNOVER	(iv)	a 12 month moving summary of turnover statistics	H I O	accession, departures transfers, reasons date left
62	SOURCE	(ii)	evaluation of applications see where applications coming from, checks efficiency of recruiting proc.	H, I	
63	RESPONSIBILITY	(ii)	responsibility levels of total work force of the firm by no. of people at each level	I	resp. levels (code) no people at each level
64	ATTITUDE	(iii)	an attitude survey of the whole company	I, C	attitude survey firm
65	GRIEVANCE		list of grievances per period by code, action taken, and level at which it was settled	T I F	grievance (code) action taken level settled at
66	SCHEDULE	(iv)	or (i) use the computer to schedule shift work planning	O, N	jobs to be done, men to do them, times available, union rules

No.	NAME	DESCRIPTION	RECEIVER	DATA REQUIRED
67	OPENING	(iv) list of all jobs coming open in the next following period	Q, H, I	job openings type man required
68	COMPETITORS	(ii) analyses and research output of data available on competitive salary levels	I, G	wage data area of source
69	SAFETY	(ii) looks at plant level by designated areas to see where accidents occur	I, R	accident location
70	STABILITY	(ii) looks at cyclical nature of the stability of the labour force to predict demand for labour	I	terminations date left
71	ACCIDENT-PRONE	(ii) looks at records of those with many accidents to yield data for possible correlation	I, R	name no. of accidents type of accidents
72	TRAIN-COSTS	(iii) looks at costs associated with various training plans to help policy formulation	U, E, I	training prog. no. of trainees, cost per trainee, cost of program
73	MAINTENANCE	(iv) printout of all maintenance charges (labour) for the period	M, N	daily wage sheet cost of lab per hr location of charge

No.	NAME		DESCRIPTION	RECEIVER	DATA REQUIRED
74	RECRUIT	(iv)	central listing of all manpower needs by the divisions	I, H	positions open, qualifications, location, starting salary, date open
75	REFERENCE	(iv)	printout requesting reference check	references on appl card	name, prev. ed. address, supervisor
76	RATECHANGE	(iv)	to notify employee and supervisor of new job rate	P, employee G	
77	LAYOFF	(i)	lists most vulnerable employees in case of layoff	O, M	seniority date position
78	FIRST-AID	(iv)	routine calls at first aid station and disposition		type of injury (code) disposition (code) date
79	PROFIT-SHARE	(ii)	lists employee participation in the profit sharing program	G	$ won in share name occupation
80	PROF-ASSOC.	(iii)	lists employees belonging in various prof. assoc. by group a member of	F, G	name occupation prof. assoc.

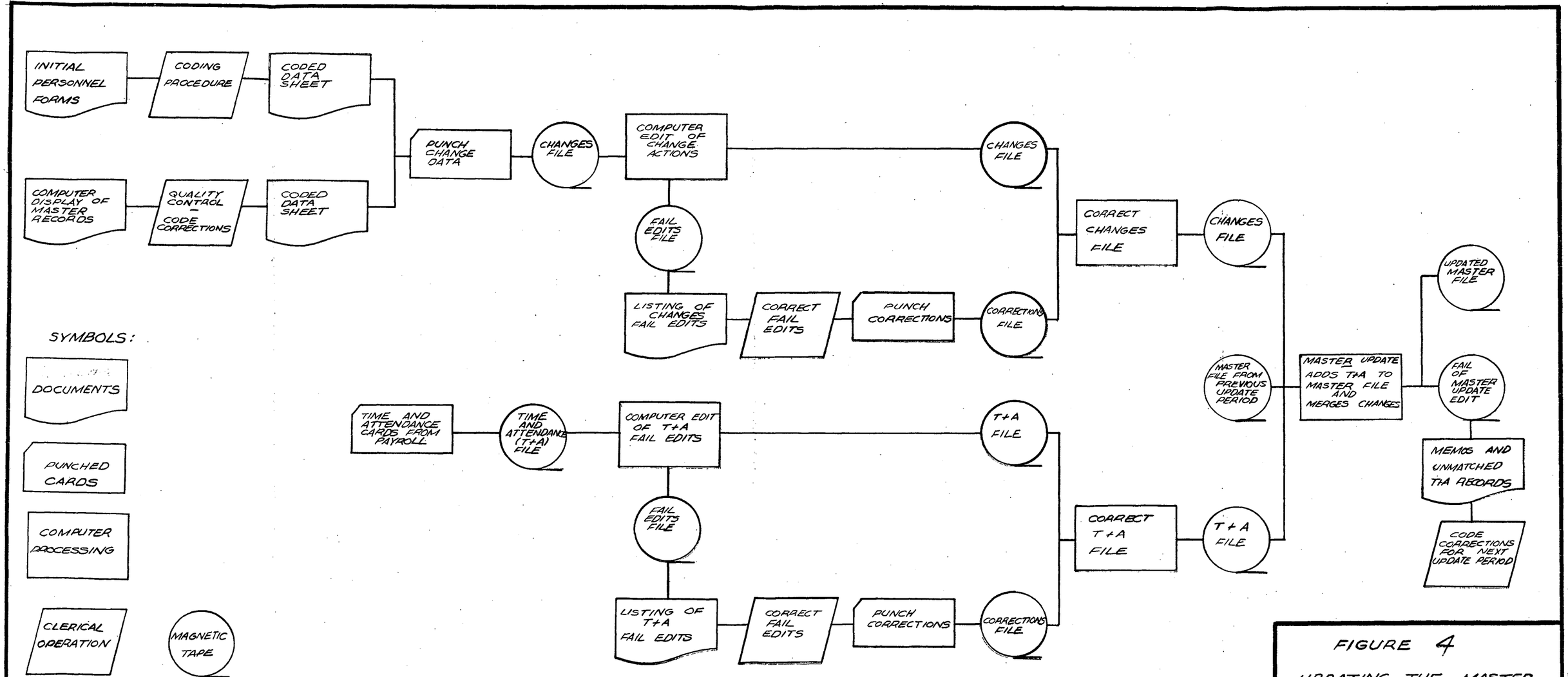
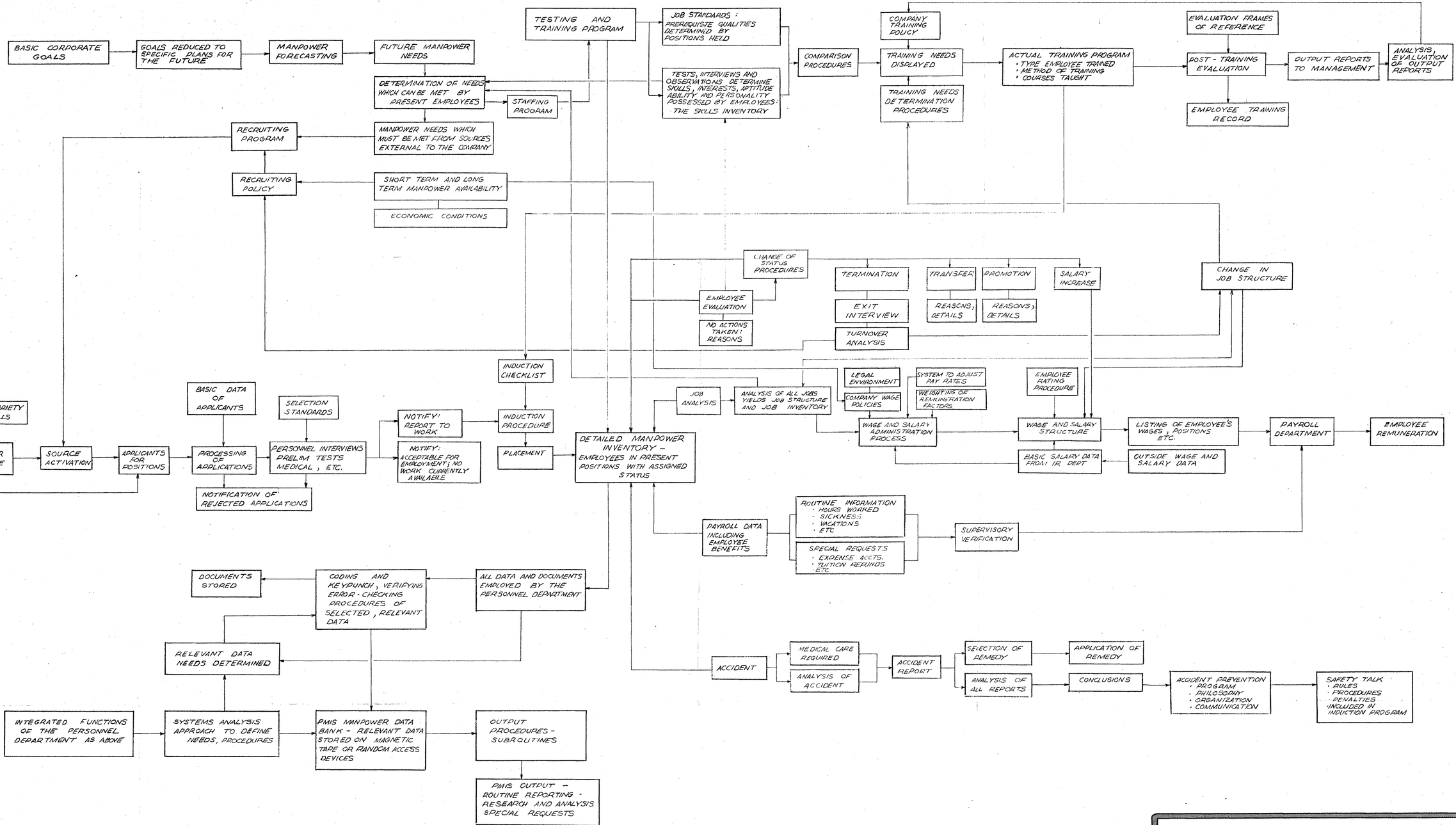


FIGURE 4

UPDATING THE MASTER FILE

(SOURCE: UNPUBLISHED U.S. GOVT. MANUAL)



APPENDIX A

PERSONNEL MANAGEMENT INFORMATION SYSTEMS - INFORMATION FLOWS

K. MORRISON
COMM 549

NOVEMBER, 1967
VANCOUVER BC

BASIC CORPORATE GOALS

GOALS REDUCED TO SPECIFIC PLANS FOR THE FUTURE

MANPOWER FORECASTING

FUTURE MANPOWER NEEDS

DETERMINATION OF NEEDS WHICH CAN BE MET BY PRESENT EMPLOYEES

STAFFING PROGRAM

MANPOWER NEEDS WHICH MUST BE MET FROM SOURCES EXTERNAL TO THE COMPANY

RECRUITING PROGRAM

RECRUITING POLICY

SHORT TERM AND LONG TERM MANPOWER AVAILABILITY

ECONOMIC CONDITIONS

TESTING AND TRAINING PROGRAM

JOB STANDARDS : PREREQUISITE QUALITIES DETERMINED BY POSITIONS HELD

TESTS, INTERVIEWS AND OBSERVATIONS DETERMINE SKILLS, INTERESTS, APTITUDE ABILITY AND PERSONALITY POSSESSED BY EMPLOYEES: THE SKILLS INVENTORY

COMPARISON PROCEDURES

COMPANY TRAINING POLICY

TRAINING NEEDS DISPLAYED

TRAINING NEEDS DETERMINATION PROCEDURES

ACTUAL TRAINING PROGRAM
- TYPE EMPLOYEE TRAINED
- METHOD OF TRAINING
- COURSES TAUGHT

EVALUATION FRAMES OF REFERENCE

POST-TRAINING EVALUATION

EMPLOYEE TRAINING RECORD

OUTPUT REPORTS TO MANAGEMENT

ANALYSIS, EVALUATION OF OUTPUT REPORTS

CHANGE OF STATUS PROCEDURES

EMPLOYEE EVALUATION

NO ACTIONS TAKEN: REASONS

TERMINATION

EXIT INTERVIEW

TURNOVER ANALYSIS

TRANSFER

REASONS, DETAILS

PROMOTION

REASONS, DETAILS

SALARY INCREASE

CHANGE IN JOB STRUCTURE

INDUCTION CHECKLIST

INDUCTION PROCEDURE

PLACEMENT

WIDE VARIETY OF SKILLS

LABOUR FORCE

SOURCE ACTIVATION

APPLICANTS FOR POSITIONS

BASIC DATA OF APPLICANTS

SELECTION STANDARDS

PROCESSING OF APPLICATIONS

PERSONNEL INTERVIEWS PRELIM TESTS MEDICAL, ETC.

NOTIFICATION OF REJECTED APPLICATIONS

NOTIFY: REPORT TO WORK

NOTIFY: ACCEPTABLE FOR EMPLOYMENT; NO WORK CURRENTLY AVAILABLE

DETAILED MANPOWER INVENTORY – EMPLOYEES IN PRESENT POSITIONS WITH ASSIGNED STATUS

JOB ANALYSIS

ANALYSIS OF ALL JOBS YIELDS JOB STRUCTURE AND JOB INVENTORY

LEGAL ENVIRONMENT

COMPANY WAGE POLICIES

SYSTEM TO ADJUST PAY RATES

WEIGHTING OF REMUNERATION FACTORS

WAGE AND SALARY ADMINISTRATION PROCESS

EMPLOYEE RATING PROCEDURE

WAGE AND SALARY STRUCTURE

BASIC SALARY DATA FROM I.R. DEPT

LISTING OF EMPLOYEE'S WAGES, POSITIONS ETC.

OUTSIDE WAGE AND SALARY DATA

PAYROLL DEPARTMENT

EMPLOYEE REMUNERATION

PAYROLL DATA INCLUDING EMPLOYEE BENEFITS

ROUTINE INFORMATION
- HOURS WORKED
- SICKNESS
- VACATIONS
- ETC

SPECIAL REQUESTS
- EXPENSE ACCTS.
- TUITION REFUNDS
- ETC

SUPERVISORY VERIFICATION

ACCIDENT

MEDICAL CARE REQUIRED

ANALYSIS OF ACCIDENT

ACCIDENT REPORT

SELECTION OF REMEDY

ANALYSIS OF ALL REPORTS

APPLICATION OF REMEDY

CONCLUSIONS

ACCIDENT PREVENTION
- PROGRAM
- PHILOSOPHY
- ORGANIZATION
- COMMUNICATION

SAFETY TALK
- RULES
- PROCEDURES
- PENALTIES
- INCLUDED IN INDUCTION PROGRAM

ALL DATA AND DOCUMENTS EMPLOYED BY THE PERSONNEL DEPARTMENT

CODING AND KEYPUNCH, VERIFYING ERROR-CHECKING PROCEDURES OF SELECTED, RELEVANT DATA

DOCUMENTS STORED

RELEVANT DATA NEEDS DETERMINED

INTEGRATED FUNCTIONS OF THE PERSONNEL DEPARTMENT AS ABOVE

SYSTEMS ANALYSIS APPROACH TO DEFINE NEEDS, PROCEDURES

PMIS MANPOWER DATA BANK - RELEVANT DATA STORED ON MAGNETIC TAPE OR RANDOM ACCESS DEVICES

OUTPUT PROCEDURES - SUBROUTINES

PMIS OUTPUT – ROUTINE REPORTING - RESEARCH AND ANALYSIS SPECIAL REQUESTS

APPENDIX A

PERSONNEL MANAGEMENT INFORMATION SYSTEMS - INFORMATION FLOWS

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NOVEMBER, 1967
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