PLANNING FOR ELECTRONIC DATA PROCESSING IN THE HOTEL

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Dan W. Darrow

1961

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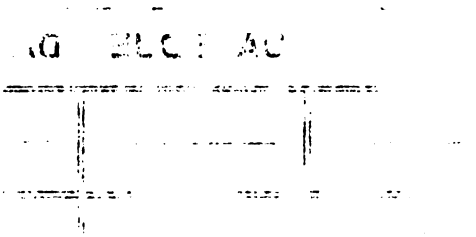

ABSTRACT

PLANNING FOR ELECTRONIC DATA PROCESSING IN THE HOTEL

by Dan W. Darrow

The purpose of this study is to present the steps a hotelman should go through when considering the feasibility of utilizing electronic data processing equipment (EDP) as a possible management tool. EDP systems analysis is applied directly to the communication of information flow network.

The ultimate goal is to place in proper perspective the potentialities and limitations of EDP in the hotel. This report is given not necessarily as a singular possible approach to a solution for the information volumes and the "profit squeeze," but as an attempt to dispel the fears a hotelman may have that EDP is too complex or too expensive to consider. To those who have transcended this psychological resistance, a systematic caution is necessary in planning for EDP.

The collection of data for this study came from several sources. Of primary importance was information gained by interviews with representatives of two leading EDP manufacturers. This same information was verified by a new but well regarded EDP consulting firm who also provided a portion of the statistical data, equipment costs, and conceptual EDP approaches.

Equal emphasis with the information gained above must be given to the information supplied by the Research Director of the Sheraton Hotel Corporation, Boston, Massachusetts.

The systems analysis and overall feasibility information was gathered from numerous current publications, government reports, and

articles from trade publications available in the files of the Michigan State University Library and the Baker Library at Harvard Business School, Cambridge, Massachusetts.

Two additional non-directive interviews conducted by the writer were of considerable help in providing an opportunity for observation of actual equipment operations. These talks were with the Auditor of the Palmer House Hotel, Chicago, Illinois, and with the Director of EDP for Pan American World Airways, Guided Missiles Range Division at Patrick Air Force Base, Florida.

As a result of the collection of data and interviews conducted, three distinct phases appear relevant in the planning for EDP. Phase One involves the important selection of a hotel oriented EDP study team, along with the engagement of a qualified EDP consultant to assist in the planning. Such a group, carefully guided by the consultant, can deal with the specific areas susceptible to EDP and can isolate the present and future hotel goals and objectives, and examine the communication flow systems. Each step of the evaluation is an attempt to determine sources of information, critical data, the time and cost required to produce the results.

Phase Two. The completion of this examination phase of the feasibility study means that the various EDP manufacturers are in a position to apply their specific "hardware" to the communications model to answer the desired information handling systems.

Phase Three. The final step is to consider the financial aspects of each equipment approach by comparing costs of the present manual operation with the expenditure necessary to operate the EDP system. The resulting economies may be appreciable, marginal, or prohibitive. However, it is

only through a combined effort on the part of the hotelman, consultant and manufacturer that assurance can be given that the numerous EDP pitfalls will be avoided and that, if EDP equipment is selected, it will be the answer the hotelman needs in view of his future objectives and financial limitations. Regardless of the outcome of the feasibility study, the decision should not be to forego EDP completely. Rewards may be gained by a continual systems flow examination. The continued and necessary standardization of operation may enable the application of EDP at a later date when other factors (i.e., equipment cost, communications volume) are sufficiently brought in line.

PLANNING FOR ELECTRONIC DATA PROCESSING IN THE HOTEL

by

DAN W. DARROW

A THESIS

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When the history of our age is written, I think it will record three profoundly important technological developments:

> Nuclear energy, which tremendously increases the amount of energy to do the world's work;
>
> Automation, which greatly increases man's ability to use tools;
>
> And computers, which multiply man's ability to do mental work.

Some of our engineers believe that of these three, the computer will bring the greatest benefit to man.

Ralph J. Cordiner (1956)

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	Background Information	1
	Purpose of the Study	3
	Scope of the Problem	3
	Review of Literature	5
	Government and Business Applications of EDP	6
	EDP Application to the Hotel Industry	9
II.	METHODOLOGY	12
	Gathering Data	12
	Method of Presentation	13
	Delimitations	14
	Definition of Electronic Data Processing	16
	Definition of Terms	18
III.	EXAMINATION OF THE HOTEL	26
	Initial Step of Evaluation	26
	Clerical and Decision Making Requirements	28
	Consultant and Advisory Group Formation	28
	Establish Employee Relations	30
	Systems Analysis for Hotels	31
	Information Volumes	38
	Importance of Information Gathered	45
	Selection of Job Classifications Susceptible to EDP	46

CHAPTER PAGE

Isolation of Inputs 48
Summary 55
IV. EQUIPMENT JUSTIFICATION 56
Quantity of Information Necessary 57
Generation of Operational Data 57
Processing of Data 59
Presentation of Data and Its Response 62
Additional Equipment 64
Lease vs Purchase and Use of Computer Service Center 64
Equipment Obsolescence 66
One-time Costs 67
Recurring Costs 69
Return on Investment 71
Intangible Savings 72
Hidden Economic Pitfalls 74
Hotel Payroll and Its Relation to EDP 76
Summary 78
V. SUMMARY AND CONCLUSIONS 79
BIBLIOGRAPHY 83
APPENDIX A. Computer System Operation 88
APPENDIX B. Four Electronic Data Processing Equipment Applications 94

LIST OF TABLES

TABLE		PAGE
I.	Typical Job Classifications Affected by EDP	47
II.	Potential Payroll Savings by Department	49
III.	Inputs - Food Cover System	51
IV.	Essential Inputs by Systems	54
V.	Operational Personnel for an EDP System	70
VI.	Gross Hours and Earnings of Production Workers	77
VII.	Comparison of Three Computer Capabilities	99

LIST OF FIGURES

FIGURE		PAGE
I.	Room System	33
II.	Guest Cover System	35
III.	Purveyor Food Control System	36
IV.	Electronic Computer System	90
V.	Sample Run for Posting Daily Room Charges by Punchcard System	97

CHAPTER I

INTRODUCTION

Background Information

Historically, the hotel's answer to the rise of fixed and variable costs has been to raise the price of the room [1] in anticipation of additional revenue and ultimately profit. Since the economy has been basically an inflationary one for the past decade, [2] the hotel has been able to realize a profit at the expense of the guest with very little tangible value added to the product (room and service). Times are changing and while these operating expenses increase, due largely to labor expense, [3] occupancy rates have gradually declined. [4] The likelihood of the hotel meeting with success by continuing its present price-raising method of solving the shrinking profit situation is an extremely dim one. Where, then, must the hotelman turn in the coming sixties to realize a profit? All present factors indicate that the hotel managers will be faced with the challenge of a population growth with more discretionary income to spend

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[1] Horwath and Horwath, Hotel Operations in 1959 (New York: Horwath and Horwath, 1960), pp. 22-23.

[2] McCann-Erickson, The Decade of Incentive (New York: McCann-Erickson, Inc., 1960), p. 7.

[3] Harris, Kerr and Foster, Trends in the Hotel Business (New York: Harris, Kerr, Foster and Company, 1954), p. 2.

[4] Horwath, loc. cit.

on travel; [5] a rise in consumer credit; [6] a continued increase in wages and operating costs as well as a possible periodic encounter with recessions [7] and an increase in governmental legislation. Hotel accounting textbooks look dimly on the policy of cutting rates in an effort to attract more guests and generate more dollar volume. [8] The method of expanding hotel holdings by buying old ones at a "bargain", renovating them and expecting increased business, is becoming less popular since there are fewer hotels today that qualify under this category of "good buys." Adding to existing hotels or building new ones is rapidly becoming a complex financial proposition due to the high interest and principal charges, plus an even higher construction cost -- a practice for the very rich or very large hotel chain. [9]

Where the Solution May Lie

The relief necessary seems to be not so much in the gradual increase or decrease of rates, hoping for an expansion of sales to be eaten up by a faster growing rate of costs, but rather in the consideration of the new, more scientific tools of management. These must be the management tools that point to a sharpening of goals and definition of purpose

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[5] McCann-Erickson, op. cit., p. 18.

[6] John A. Postley, Computers and People (New York: McGraw-Hill Book Company, Inc., 1960), p. 15.

[7] McCann-Erickson, op. cit., p. 11.

[8] E. B. Horwath and Louis Toth, Hotel Accounting (New York: Roland Press Co., 1956), p. 405.

[9] Carl Rieser, "Sheraton vs Hilton -- Playing Checkers with 60,000 Rooms," Fortune, Vol. LXII, No. 1 (January, 1961).

through efficiencies and economies of operations that will provide reductions to existing expenditures. This may mean doing away with daily stereotyped methods of doing business; it may mean diverting emphasis of control or altering long and short range goals; it may mean implementing plans for electronic and electromechanical efficiencies heretofore thought to be too extreme. Nevertheless, each effort must be aimed at a systematic, proven "tightening of the belt" to provide the desired spread between revenue and expense, as well as to generate an improved atmosphere for customer service with its by-product of increased patronage (sales).

Purpose of Study

One such management tool is the subject of this study: Electronic Data Processing (EDP). This discussion points out the various data processing considerations that any hotelman should evaluate if he is to realize the primary goals of innkeeping today. Those goals are to: (1) increase profit, (2) decrease costs, and (3) improve customer service, with such flexibility that adjustments can be made accurately to any future social or economic conditions. More specifically, this report is intended to generate the interest and the necessary thought stimuli a manager or owner must experience in order to ensure proper evaluation of all facts prior to any purchase of EDP equipment.

Scope of the Problem

The scope of the problem is to place in proper perspective the potentialities and limitations of EDP in the hotel industry. It is further

intended to dispel the fears a hotelman may have in considering EDP for his operation, as well as an attempt to prevent a poor EDP application as a result of insufficient planning.

More and more articles about the numerous new methods of doing things through the use of electromechanical devices appear in various trade publications. Even more noticeable is the increased availability of commercial data processing equipment for business applications aimed at providing a possible solution to handling the increased volume of information being generated by our expanding economy. [10]

What is the application of EDP to the hotel world? Is it worth looking into? Where does an interested hotelman go first to find out about data processing equipment?

Conflicting viewpoints exist between the manufacturers of data processing equipment and the so-called data processing experts regarding applications of EDP equipment. On the one hand, the manufacturer presents facts and figures that will attest to the super-human abilities of their automatic giants to solve the average businessman's problems. On the other hand, textbooks and dissertations from the experts say that, although manufacturers' claims cannot be disputed as to the abilities of this equipment to handle data quickly and more accurately than the human, caution must be shown with regard to the manufacturers' claims as to the ease with

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[10] "The Fabulous Fifteen Years Ahead," Changing Times, The Kiplinger Magazine (January, 1961), p. 8.

which this equipment can be installed and implemented.[11] So often one has the impression that all that is necessary is to plug the machine into an electrical outlet and the machine will begin to spout forth volumes of critical data. Such is not the case. Electronic data processing systems should be considered by every businessman today and he should not allow the common psychological fear of new business concepts to prevent him from this consideration. However, it is only through systematic analysis and preplanning of all phases of data processing (administrative, economic, and social) that a hotel manager may realize, or hope to realize, any type of reward or improvement of his competitive position in the industry and not hinder his primary responsibility to provide service acceptable to the guest.

Review of Literature

The books, pamphlets, and articles read and the interviews conducted in an attempt to prepare for this discussion have, for the most part, dealt with EDP planning in a general fashion or have applied data processing (DP) preplanning to the business situations of manufacturing, insurance, or governmental organizations. Several applications which may have a close association with the hotel problems are mentioned on pages 8, 9, and 10. The intention of the writer is not to indicate that every possible written article has been covered or that these applications

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[11]Postley, op. cit., p. 195.

are the only ones in existance. The intention is to show representative examples of EDP at work in and around hotels.

Government and Business Applications of EDP

One of the largest users of EDP has also provided considerable funds for the development of its principles. The U. S. Government, as discussed by John Postley in his book, Computers and People, has been in the computer business for twenty years beginning with EDP's first practical application to the population count in the 1890 census. The Department of Agriculture, the Tresury Department, and several agencies involved in national defense have become active in the computer field. [12] Equipment is now in use by the government in Providence, R. I., that practically eliminates the human handling of letters in the local Post Office. Letters are separated, cancelled, sorted by destination, and transported to destination bins electrically. [13] Postley further indicates that there will be, in the near future, such far-reaching EDP applications as the handling of air traffic by means of a centralized control network, and a computer which will abstract and translate foreign languages. These are but two of the unlimited horizons available to man in solving the endless communications challenges. [14] In the immediate business world, Postley states that the advent of computers and the development of machines capable of reading material printed in magnetic ink has enabled banking institutions

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[12] Postley, op. cit., p. 221.

[13] News item in the Boston Traveler, Friday, October 21, 1960, p. 23.

[14] Postley, op. cit., p. 212, 236.

to meet their problems of increased paperwork. Bankers feel that the present annual ten billion check volume will increase to fourteen billion by 1960 and to twenty billion in 1970. [15]

Various commercial retail outlets have taken great strides in perfecting methods of handling inventories through the use of prepunched ticket stubs which carry prescribed information and are attached to an item as it is received. The stubs are detached at various points in the process of a sale and are accumulated daily to be handled electromechanically. The overall benefits realized lie in tighter control of the items sold, ease of reordering items, less capital invested in inventory, and less duplication of administrative effort by employees which allows more time for customer attention. [16] Several large retail outlets, according to an article appearing in Business Week, feel that the optical scanner (now in the embryonic stage) will be the answer to the growing volumes of customer charges, increased work in the preparation of statements, and the growing need for better inventory controls. The perfection of the optical scanner would allow the translation of raw data (sales slips) into computer language without the necessity of translating the written word into punched cards. [17]

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[15] Ibid., p. 208.

[16] Electronic Data Processing for Retailers (New York: Retail Research Institute, National Retail Merchants Association, 1960)

[17] Business Week, March 18, 1960, p. 85.

One of the most publicized uses of EDP in the commercial field today is the airline automatic reservations system (RESERVISOR). According to a study by the U. S. Bureau of Labor Statistics, [18] this system provides an up-to-date inventory of airline seat reservations by use of a central memory drum. Virtually all of the leading airlines today use RESERVISOR. Its implementation was brought on by the advent of jet aircraft and the growth of passenger volume which has caused an ever-increasing volume of paperwork and clerical costs. Sufficient time has not yet elapsed to indicate whether the system has reduced or curtailed the increased administrative workload. The Bureau of Labor Statistics, in a study of automatic technology, shows how one large insurance company met with financial success as a result of introducing an electronic computer into its daily procedures. Here again, the success seems to be proportional to the size of the organization as the study shows the insurance company employs about 14,000 people. [19]

Additional pertinent information dealing with EDP planning guideposts can be found in the actual experiences encountered by a west coast airplane manufacturing firm. R. G. Canning in his book, Installing Electronic Data Processing Systems, gives factual information on the complete implementation of data processing with specific duties and requirements

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[18] U. S. Department of Labor, Bureau of Labor Statistics, Studies of Automatic Technology: A Case Study of an Automatic Airline Reservation System, Report No. 137 (Washington: Government Printing Office, July, 1958).

[19] U. S. Department of Labor, Bureau of Labor Statistics, Studies of Automatic Technology: The Introduction of an Electronic Computer in a Large Insurance Company, Report No. 2 (Washington: Government Printing Office, October, 1955).

to be performed by all members of the firm. [20] Similar information is available in George Kozmetsky's book entitled, Electronic Computers and Management Control, New York, McGraw Hill Co., 1956.

EDP Application to the Hotel Industry

Recently, numerous articles appearing in hotel publications have indicated an increased awareness of the potential attributes of EDP to the hotel. C. A. Horrworth [21] states that the hotel industry is beginning to experience the benefits of automation and he feels one of the most vulnerable spots for application is the accounting function. He suggests other possible areas in which studies might be conducted; such as, an automated kitchen that would accomplish many of the preparation and service functions automatically, and coin machines that would provide such services as suit pressing. He further stresses the need for adequate research to determine the best approach to automation and its economic aspects. Ernest Henderson, [22] President of Sheraton Corporation of America, indicates his company is utilizing EDP to handle guest reservations quickly and efficiently by use of their "RESERVATRON" unit. This electronic memory system is installed

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[20] Richard G. Canning, Installing Electronic Data Processing Systems (Washington, D. C.: University Press of Washington D. C., 1956).

[21] Charles A. Horrworth, "Research -- The Key to Successful Operation in the Golden Sixties," The Cornell Hotel and Restaurant Administration Quarterly, Vol. 1, No. 2, (August 1960), p. 10.

[22] Ernest Henderson, "The Sheraton Story Today," An address to the National Association of Investment Clubs on October 28, 1960 at the Sheraton-Cadillac Hotel, Detroit, Michigan.

throughout the chain to answer the growing emphasis placed on immediate referral accomodations now felt to be 25% of Sheraton's reservation business. [23] The Palmer House in Chicago has in operation an IBM punchcard system which handles automatically the hotel's general ledger, accounts receivable and payable, trial balance, and collection letters. The equipment is also used for such employee records as time cards, payroll, withholding tax, social security and bond-a-month plan. [24]

Numerous articles perused by this writer dealt with the automation of a particular hotel functional service and not with the handling of information electronically. An article entitled, "Electronics Plays Key Role . . .", written by Joseph J. Haszonics, reveals the accumulation of most of the electrical equipment available to the hotelman today in the San Francisco Jack Tar Hotel. The particular hotel discussed has an electrical room availability display board which indicates the occupancy status of any given room. It has a closed circuit television check-in screen which obviates the necessity of the guest leaving his car at check-in and check-out time. Additional equipment includes an electrical maid call and message light, a crystal-controlled radio receiver and warning device, direct dial telephones, and self-operating passenger elevators. [25]

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[23] Rieser, loc. cit.

[24] "UARCO Forms Aid Hotel Accounting," UARCO Barker (January, 1960) p. 405.

[25] Joseph J. Haszonics, "Electronics Plays Key Role as Jack Tar Opens in 'Frisco," Hotel Management, (May 9, 1960) pp. 1-2.

The Statler Foundation provided a $70,000 grant to the School of Hotel Administration of Cornell University, Ithaca, N. Y., to be used for research and study into possible EDP application to hotel record keeping. [26]

R. C. Ferber of the Zeckendorf Corporation feels that if more than a token appreciation of EDP is to be realized, new concepts must be considered in handling information in the hotel to solve management's problems of "Quantity, Price, and Availability" of rooms. He feels that management must have access to numerous resources possibly available through EDP and must learn to utilize them successfully through techniques such as operations research. Ferber also states one fact that may be the key reason for the lack of extensive studies of EDP application in the hotel industry; that is, it costs money, requires trained people, and takes time. [27] Adams Associates feels potential application has more to do with labor costs and whether a company can justly say it has a standardized operation. [28]

Government and industry are finding new uses for EDP equipment, especially in the relatively new area of internal communication and information flow. Although limited, the hotel is exhibiting an increased awareness of the potentialities of EDP for the industry. This possibly supports, then, an attempt to incorporate in written form the capabilities of EDP as they may apply to the hotel communication flow systems.

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[26] "How's Business: A Monthly Analysis of Business Trends Affecting Hotels," The Hotel Monthly (August, 1960) p. 12.

[27] Robert C. Ferber, "Space Age Innkeeping," Hotel Gazette (April 25, 1959) p. 1, 12.

[28] "Layman's Guide to Computers," Business Week (September 10, 1960), p. 164.

CHAPTER II

METHODOLOGY

Methods of Gathering Data

The collection of data for this study came from several sources. Of primary importance was information gained by interviews with representatives of two leading EDP manufacturers -- Minneapolis-Honeywell Electronic Data Processing Division and International Business Machines Corporation. The results of these discussions appear in numerous points in Chapters III and IV, especially where specific hotel application of equipment attributes and capabilities are discussed. This same information was verified by a new but well regarded EDP consulting firm, Adams Associates, located in Maynard, Massachusetts. A member of this firm also provided a portion of the statistical data, equipment costs, and conceptual approaches that appear in Chapter IV and Appendix B.

Equal emphasis with the information gained above must be given to the information supplied by the Research Director of the Sheraton Hotel Corporation, Boston, Massachusetts. Much of the detail flow analysis and procedure presented in Chapter III and the justification for EDP equipment in Chapter IV was gathered as a result of the close working relationship the writer was fortunate to share throughout the preliminary EDP examination of this corporation. However, the views expressed herein and the approaches taken are not necessarily supported by this corporation nor its employees.

The systems analysis and overall feasibility information was gathered from numerous current publications; such as, Stanford L. Optner's Systems

Analysis and John A. Postley's Computers and People, government reports and articles from trade publications available in the files of the Michigan State University Library and the Baker Library at Harvard Business School, Cambridge, Massachusetts.

Two additional non-directive interviews conducted by the writer were of considerable help. Each provided an opportunity for observation of actual equipment operation and was beneficial in the isolation of specific applications to the hotel problems in Chapters III and IV. These talks were with the auditor of the Palmer House Hotel, Chicago, Illinois, and with the Manager of EDP for Pan American World Airways, Inc., Guided Missiles Range Division at Patrick Air Force Base, Atlantic Missile Test Center, Florida.

In addition to the six month's EDP work experience with Sheraton Hotel Corporation, a thirty-five hour course on programming was completed during October, 1960. This course provided a working knowledge of fundamental computer operations and appears in Appendix A. The data was gathered between June and December of 1960.

Method of Presentation

The approach taken in the discussion of the data is to first present in Chapter III the specific steps necessary in the internal analysis of a hotel contemplating EDP. This involves an early evaluation of what the hotel goals are, whether there is a need for an EDP study, where problem areas may exist. The next step lies in an evaluation of the information flow through the hotel, how it might possibly be improved, and what might be

gained from it. Eventually a picture is formed which indicates how the hotel functions and what is the per-unit cost of operation.

Chapter IV presents the next segment of analysis which compares this operation image with what is actually needed. The new operation image is then in a condition to be applied to specific EDP systems through the guidance of several equipment manufacturers or EDP consultants. Equipment justification and the various pitfalls surrounding hidden expenditures are discussed in Chapter IV and Appendix B. The decision to proceed or not proceed with EDP is then up to management. Additional EDP information is presented in a Definition of Terms (p. 18) and in the Appendices, which may help the reader to better understand how a computer operates and how EDP may possibly apply to a hotel situation.

Delimitations

Two distinct segments present themselves in any complete application of EDP to a business operation; one involves the pre-planning or feasibility study necessary to properly evaluate the business situation for possible utilization of EDP. This should occur prior to any commitment for the purchase of hardware. The second segment entails the planning for and the actual installation of the EDP equipment after a purchase contract is negotiated. This second segment requires a detailed examination of the effects EDP may have on specific internal hotel areas such as the physical facilities available to house the equipment. It must also consider the social and psychological impact EDP may have on employee, guest, and competitor. It must determine the necessary course of action that will insure the cooperation

of all employees during the transition to EDP and should prepare the individual employee for changes in his daily work routines. It must formalize its procedure for the training and upgrading of these people. It should further consider what approach must be taken to psychologically prepare the guest in order to insure his acceptance of EDP as a better way of service, if the guest is affected.

Each of these two segments (feasibility study or equipment implementation) provides ample opportunity for thesis examination. This study is concerned with the first.

Several other areas of interest are associated with this discussion. The scope of this study will not allow any more than a mention of the area concepts. These include:

1. Cybernetics. A comparative study between the mind and its thinking processes with that of an electronic or electromechanical memory system.
2. Operations Research. "The scientific approach to and analysis of business problems, aimed at providing management with information for obtaining most effective overall operation of the business." [29]
3. Data Processing Communications and Telemetering Facilities. This involves the intricate economic, physical, and legal

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[29]Robert Furguson, Introduction to Operations Research (Greenwich, Conn.: Management Publishing Corp., 1956), p. 396.

complexities of transmission of data between two points separated by large distances.

4. Electronic Process Control (Industrial). This automatic system affords new horizons for industrial firms engaged in systematic, routine processing or handling of raw material or liquid products. The systems operate automatically through the use of various electromechanical controls. The devices require limited human intervention.
5. Analogue Computers. An electronic calculating machine that uses physical quantities, such as lengths, voltages, or shaft revolutions to represent numerical variables that occur in a problem.
6. Special Purpose Digital Computers. The special purpose computer processes specific applications or similar problems. The basic program is built into the hardware and variations are limited.

Definition of Electronic Data Processing

The rapid growth of digital computers and associated equipment in the business world has caused some difficulty in providing definitions for equipment concepts involved in the various forms of data processing. Automation has several definitions, depending on the author and its business application. Generally, it is considered to be "the use of automatic techniques for an integrated material handling and processing operation." [30]

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[30] Richard G. Canning, Electronic Data Processing in Business and Industry (New York: John Wiley & Sons, Inc., 1956), p. 6.

Data Processing (DP) [31] involves any process whereby predetermined information is handled in a prescribed flow and usually involves any type of media or equipment from verbal to electronic. Integrated Data Processing (IDP) [32] is the handling of information in a common language form by the use of any combination of automatic or semi-automatic (electromechanical) equipment. The addition of the word "electronic" to any of these words presents somewhat of a problem since, to be completely consistent with the term itself, there must be an electronic signal or pulse involved and the transmission of information must be handled by these pulses to qualify as Electronic Data Processing Equipment. [33] How then is a group of equipment correctly described which has a central computer (electronic) in which the input and output data is handled by means of a typewriter (mechanical) or a card reader (electromechanical)? The answer, in some instances, lies in the use of the word "systems." The addition of this word tends to eliminate the disparity arising when this combination of electromechanical and electronic driven equipment is matched up in a "package." The only question left is one that is not fully solved in data processing circles; this is the exact difference between an Automatic Data Processing System (ADP) and an Electronic Data Processing System. Since this question is somewhat

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[31] See Definition of Terms, p. 18.

[32] Daniel D. McCracken, Harold Weiss, and Tsai-Hwa Lee, Programming Business Computers (New York: John Wiley and Sons, Inc., 1960), p. 6.

[33] Data Processing by Electronics, (New York: Haskins and Sells, 1955) p. 113.

academic, the reader may assume that where the term "Electronic Data Processing Systems" appears, it includes the use of ADP and is intended to include not only computers systems but also punchcard systems and the peripheral equipment involved. The abbreviation used will be EDP. The combination of electronic, magnetic, and/or mechanical components which makes up an EDP system is often referred to as the system "hardware."

Definition of Terms [34]

The technical terms listed in this section are those most frequently encountered in dealing with electronic data processing. The definitions are brief and designed primarily to identify the terms according to general usage, rather than to provide a technical discussion of meanings and applications.

A

ACCESS TIME. The time lag between the instant at which information is located in or called for from the MEMORY UNIT and the instant at which it is made available for processing; or the time required to return information to the MEMORY UNIT.

ACCUMULATOR. A unit or register in a COMPUTER in which numbers are totaled, or the results of arithmetical or logical operations are

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[34] U. S. Department of Labor, Bureau of Employment Security, Occupations in Electronic Data Processing Systems, (Washington: Government Printing Office, January, 1959); General Information Manual IBM 1401 Data Processing System from Control Panel to Stored Program, International Business Machines Corp., 1959.

first produced.

ADDRESS. In digital computer systems, a label, number, or other set of characters identifying a location where information is stored, or a machine unit to be used.

ANALOG COMPUTER. An electronic calculating machine that uses physical quantities, such as lengths, voltages, or shaft revolutions to represent numerical variables that occur in a problem.

AUTOMATIC DATA PROCESSING SYSTEM. An integrated system utilizing electronic and electromechanical equipment to process mass data or to solve mathematical problems.

AUTOMATIC PROGRAMMING. A technique in certain computing systems, in which the COMPUTER itself transforms a program into a form most efficient for the COMPUTER to carry out.

AUTOMATION. The technique or process of making machines or devices self-governing and fully automatic. The term is popularly used to include making machines or devices partially or fully automatic.

B

BINARY CODE. A system of notation consisting of 1's and 0's to represent letters or digits in a COMPUTER.

BIT.

(1) A single digit in the BINARY CODE.

(2) A single unit of information.

BLOCK.

(1) A number of machine words that are transferred or processed as a unit.

(2) A series of boxes, each representing a logical step in a programming flow chart.

C

CAPACITY. The total number of digits or CHARACTERS that may be processed by a computer.

CHARACTER. Any symbol, such as a digit or letter, that is stored or processed by a COMPUTER.

CHECK. The technique of verifying the accuracy of information stored, transferred, or processed by any component of a COMPUTER.

CHECK DIGIT. One or more digits accompanying a unit of information and used as a CHECK, so that if an error occurs, the CHECK fails and causes an alarm signal to flash.

CODE.

(1) A set of symbols representing the information contained in a COMPUTER and the operations necessary to solve a given problem.

(2) To convert problems into a code usable for the solution of a specific problem by a COMPUTER.

COMPUTER. A machine capable of performing arithmetical and logical operations automatically. The machine is capable of storing data, processing it arithmetically or logically, and supplying the results of that processing.

CONSOLE. The central control unit in an electronic computer system, through which an operator communicates instructions to or obtains information from any unit in the system.

CONTROL.

(1) The section of a computer which controls all operations of the system. It may be compared with an automatic telephone exchange.

(2) Method used to monitor or guide a program.

CONVERTER. A machine that changes information from one form of computer language to another; as for example, changing the information contained on punchcards to the same information on a magnetic tape.

CORE. (magnetic) Small doughnut-shaped device used for storage in computers. Its value is determined by its condition of magnetization.

CYBERNETICS. The study of control and communication theory in machines and humans to eventually substitute self-regulating machines for human controls.

D

DATA PROCESSING. The automatic processing of information in a sequence of logical operations.

DEBUG. To diagnose and correct COMPUTER malfunctionings or mistakes in programming.

DIAGRAM. A graphic representation of a sequence of operations designed to solve a problem or to process data.

DIGITAL COMPUTER. A COMPUTER that uses digits or yesses and noes, usually expressed in 1's and 0's, to represent the variables in a problem.

DOWN-TIME. The period during which a COMPUTER is not in operation due to malfunctioning or machine failure.

E

ELECTROMECHANICAL. Mechanical devices that are electrically controlled. Many components of a data processing system, such as the tabulating and printing machines, are electromechanical.

F

FIXED WORD LENGTH. Condition in which all storage fields have a set capacity or length, in contrast to variable word length.

FLOW CHART. A graphic representation showing the sequence of operations in a program. Flow charts are more detailed statements of an operation than a DIAGRAM.

H

HARDWARE. The electronic, magnetic, and mechanical components that constitute a computer system.

I

INPUT. Signals or information transferred from secondary or external storage units into the computer's internal STORAGE UNIT.

INSTRUCTIONS. A set of computer words or characters that define the operation to be performed by a COMPUTER.

L

LIBRARY. A set or collection of standardized PROGRAMS by which frequently occurring types of problems may be solved. The library

may be cataloged according to the type of arithmetical operation employed.

LOGIC. The science that deals with principles of exact reasoning.

LOOP. A repetition of a series of instructions in a PROGRAM.

M

MACHINE LANGUAGE. Information recorded in a form that can be handled by a computer, e.g., PUNCHED or MAGNETIC TAPE.

MAGNETIC TAPE. A reel of tape made of paper, metal, or plastic, coated with magnetic material on which data may be recorded.

MEMORY UNIT. See STORAGE UNIT.

MICROSECOND. A millionth of a second. (0.000001 seconds)

MILLISECOND. A thousandth of a second. (0.001 seconds)

N

NANOSECOND. A billionth of a second. (0.000000001 seconds)

O

ON-LINE OPERATION. An operation in which data are fed from recording instruments directly into a COMPUTER. Experimental results are reported by the COMPUTER at the end of the experiment.

ORDER. The sequence of the CHARACTERS that indicate the operations to be performed by a COMPUTER.

OUTPUT.

(1) The signals emitted by a control unit.

(2) The data transferred from the internal storage of a COMPUTER to an external storage unit.

P

PERIPHERAL EQUIPMENT. Those components or units, such as printers, converters, and tape reel units, that are separate from and operate independently from the main COMPUTER.

PROGRAM. A plan to be followed to solve a problem or process data by means of an AUTOMATIC DATA PROCESSING SYSTEM. A PROGRAM usually includes plans for transcribing and coding the data as well as plans for the use of the results.

PUNCHCARD. A standardized card suitable for punching in a meaningful pattern. The punched holes later are sensed electrically by wire brushes or magnetically by metal fingers.

PUNCHTAPE. Paper tape punched in a meaningful pattern so as to convey information to a sensing device.

R

READ. To copy information from one form of storage to another, or to sense the meaning of stored information.

REAL TIME. The time required to solve a problem and to provide an answer so that it can be synchronized with subsequent processing operations.

REGISTER. The hardware used for storing one or more machine words.

ROUTINE. A sequence of coded instructions to be followed for a COMPUTER to solve a problem.

RUN. A single complete run on a PROGRAM.

S

SENSE. To read the holes punched in a card or tape.

STORAGE UNIT. A unit in which data is stored for extraction at a later date.

SYSTEM. A COMPUTER together with its components and PERIPHERAL EQUIPMENT designed to solve a problem or process data.

V

VARIABLE WORD LENGTH. Condition in which the number of positions in a storage field or computer word is almost completely under the control of the programmer or coder. (Contrast to fixed word length.)

W

WORD. A set of CHARACTERS having a single meaning and stored and processed as a unit.

CHAPTER III

EXAMINATION OF THE HOTEL

Initial Step of Evaluation

The initial step of an EDP feasibility program is to determine whether specific business problems exist that EDP might possibly help solve or at least lighten. The natural tendency is to turn to manpower. Rising payroll costs which take 38 cents of the hotel revenue dollar [35] have been mentioned as an area of concern and probably presents the largest single challenge to the innkeeper today. What other areas of concern are there that may be more difficult to point out but which are "drags" on the profit and efficiency of the hotel? Is there a need for more and faster reports in the purchase of food items which will enable a more efficient utilization of centralized buying? Do customers realize time delays in check-in/check-out routines? Are there numerous errors in guest bills and sales sheets? Is considerable time spent in checking the accuracy of documents and reports? Are there reports, such as market forecasts and sales analyses that might be desirable but are not accomplished due to the time factor? Are there considerable quantities of dollars tied up in inventory? Should the hotel be expanded? Are numerous controls necessary to prevent pilferage?

These are just a few of the numerous questions a hotelman can ask himself. If these and other questions are sufficiently realistic, then

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[35] Harris, Kerr, and Foster, op. cit., p. 18.

he is justified in attempting to correct these situations.

As is often said by military strategists, a good defense is to have a good offense. Such is the case here. What are the major offensive objectives that must be established that will prevent the weakening defense against loss of profit? By merely rephrasing the previous questions, these five objectives or goals are presented for the reader's consideration.

1. Decrease guest check-in/check-out waiting time.
2. Decrease dollar amounts tied up in inventories and accounts receivable.
3. Reduce variable payroll costs by efficient operations.
4. Gain access to accurate and critical decision making data more quickly.
5. Eliminate needless information handling and report writing by an examination of the routine operation requirements in order that more time may be spent on customer satisfaction.

All of these objectives are intended to create greater profits and improve the competitive position while granting improved services to the guest. It is somewhat obvious that these suggested goals surround the areas of communication which have the largest payroll expenditure and the heaviest work load. The implication here is that experience has shown applications of EDP systems to be most promising where sizable concentrations of people and work exist. If savings and efficiencies are possible, it will occur in these same areas.

Clerical and Decision Making Requirements

As a general rule, the problems and objectives above fall into two separate areas of concern in the operation of the hotel. The first area surrounds the volumes of information that transpire throughout the hotel as a result of its daily operations. These are more routine and clerical in nature and tend to slow the business down with continuous growth. The second area includes the decision and/or policy making responsibilities accomplished through the analysis of various reports generated periodically. These decisions and policies may fall short of their potential goals due to the untimeliness and, often times, inaccuracy of the reports. A preliminary examination of data processing equipment gives the impression that, provided sufficient volumes exist, EDP finds its best application in those areas where certain facts (inputs) require numerous rapid arithmetic manipulations. This is followed by a rapid presentation of numerous figures and statistics (outputs) which carry a high degree of accuracy. The application may be made on a daily or periodic basis or it may be made to apply to the selection of the optimum logical alternative from among several possibilities.

A comparison of the hotel areas of concern and the capabilities of EDP equipment indicates that applications may be possible. Three questions remain. Where do these applications lie? Do these applications apply in sufficient volumes? Can the applications be justified economically?

Consultant and Advisory Group Formation

The formation of an advisory group to share in the development of

a feasibility study is recommended by various companies who have considered EDP in their own operations. Where possible, this group should be well versed in three areas; hotel financial and decision making policies; systems engineering and procedures analysis; and the technical or applied uses of data processing. It may be that competent personnel is not available within the hotel in the last two areas above. If so, it may be well to consider engaging the services of a qualified professional consultant who is familiar with the often-times confusing capabilities of the EDP equipment available in large numbers today. [36] This approach has a great deal of merit for the average and small hotel where management may or may not have sufficient background in EDP to insure a depth feasibility study. Although the consultant fees may appear to be high, [37] the reliability of the information gathered, the scope of equipment application, and the overall knowledge gained about EDP concepts will far overshadow any such expenditure. It must be kept in mind that the information gained by the manager and study group will place them just that much farther along the educational process in the event EDP is adopted.

Effort must then be directed to the assurance that this group, guided by the consultant, will have the full cooperation of all personnel from top management down. Numerous educational aids are available through colleges and equipment manufacturers which may be utilized to help familiarize the selected advisory group or manager with the necessary lay knowledge of EDP equipment.

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[36] Adams Associates, Computer Characteristics Chart (Maynard, Massachusetts: Charles W. Adams Associates, Inc., 1960).

[37] At least one consulting firm has a fee schedule of $175-$350 per man day with an estimate of thirty days being necessary for a study of this nature.

Establish Employee Relations

Prior to the initial examination of the information flow by the advisory group, consideration should be given to the psychological conditioning of all personnel during such an examination through an extensive public relations (PR) program. Industrial psychologists point out that each employee has a desire to know what he may expect with regard to his job and the hotel in general which stems from a fear or desire for security. The failure by management to recognize this need may create the logical counter expression by an individual to prevent this fear through a reluctance to participate in any such program. Just as important as the selection of competent persons to serve on the advisory group is the preparation of the employees from whom the pertinent information is to be gathered. Their cooperation can often mean success or failure of any attempt to apply EDP. The public relations approach to the dissemination of such information through bulletins, posters, talks, etc., must consider EDP's effect on the work performance of every employee; it must insure that the individual is aware that the present study is to determine the feasibility for EDP only and that progress reports will be made as to the findings of the study. Of utmost importance is to make perfectly clear the basic reasons for such a move and, if EDP is adopted, every effort will be made to upgrade and crosstrain each employee affected so that no one will suffer a loss of job or loss of pay as a result of the study or installation of EDP equipment except as a last resort.

A government survey of twenty large company office installations shows that less than one per cent of those employees affected by EDP

suffered a loss of job. Normal attrition affords the necessary tool for reducing total required manpower. [38]

The primary purpose of the employee relations approach is to gain the cooperation of the employee and his union by providing the necessary confidence in management and satisfaction of the individual's desire for security.

Systems Analysis for Hotels

Any misdirected attempt to analyze a hotel operation in a detailed manner in order to obtain an accurate picture can obviously take on staggering proportion. The result is the accumulation of volumes of statistical facts and figures which may have no particular relationship.

It is imperative that consideration be given to two distinct approaches to gather data on communications flow. One, by an examination of each department in a hotel, collecting data pertinent to its operation and its inter-relations with other departments. The second method which is supported here, may possibly assist the study group in obtaining the information desired with the degree of organization and purposefulness necessary. This method utilizes a more progressive concept of business communication evaluation through what is called the "systems approach,"

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[38] U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 1276, Adjustments to the Introduction of Office Automation: A Study of some implications of the installation of electronic data processing in 20 offices in private industry, with special reference to older workers. (Washington: Government Printing Office, May, 1960) p. 31.

and subjects the operations of the company as a whole to a logical examination of its interdependent communications flow. One does not study isolated departments. Instead, the true objectives of the information processing activities of the company must be defined. [39]

Here again, the hotelman and his advisory group are faced with another internal determination of what they consider to be these information processing activities (systems) which make up the skeleton network over which is superimposed the daily activities of the hotel. Fortunately, or not, there appears to be a similarity between all business's as to the small number of distinct, yet closely interdependent, systems and subsystems which go into making up the complete operation. [40]

In order to isolate and explain this method of analysis, the mind must first be clear of the conventional organization structures in existance and must concentrate on the isolation of independent "loops" or related bits and pieces of information that go into the completion of a system. The system in turn is integrated and interwoven with other processes and subsystems to complete the natural flow process of information. This endeavor may cut laterally or vertically through the organizational structure.

Consider the sale of a room to a guest (See Figure I, p. 33). This one act on the part of the guest creates a chain of events and flow of

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[39] Herbert T. Glantz, "Converting to Automatic Data Processing," Office Executive, (October 1957) pp. 13-16.

[40] Richard F. Neuschel, Management by System (New York: McGraw-Hill Book Company, Inc., 1960), p. 70.

INFORMATION FLOW AND INPUT DATA SHEET

LEGEND

Handling Operation

1) Separate orders

Origin of Document

1) Prepare
2) Copy on another form or duplicate

Adding to Record

1) Mark credit acceptable
2) Post

Transportation

Inspection

1) Scan order
2) Check credit
3) Adjust record
4) Reconcile
5) Compare

Storage

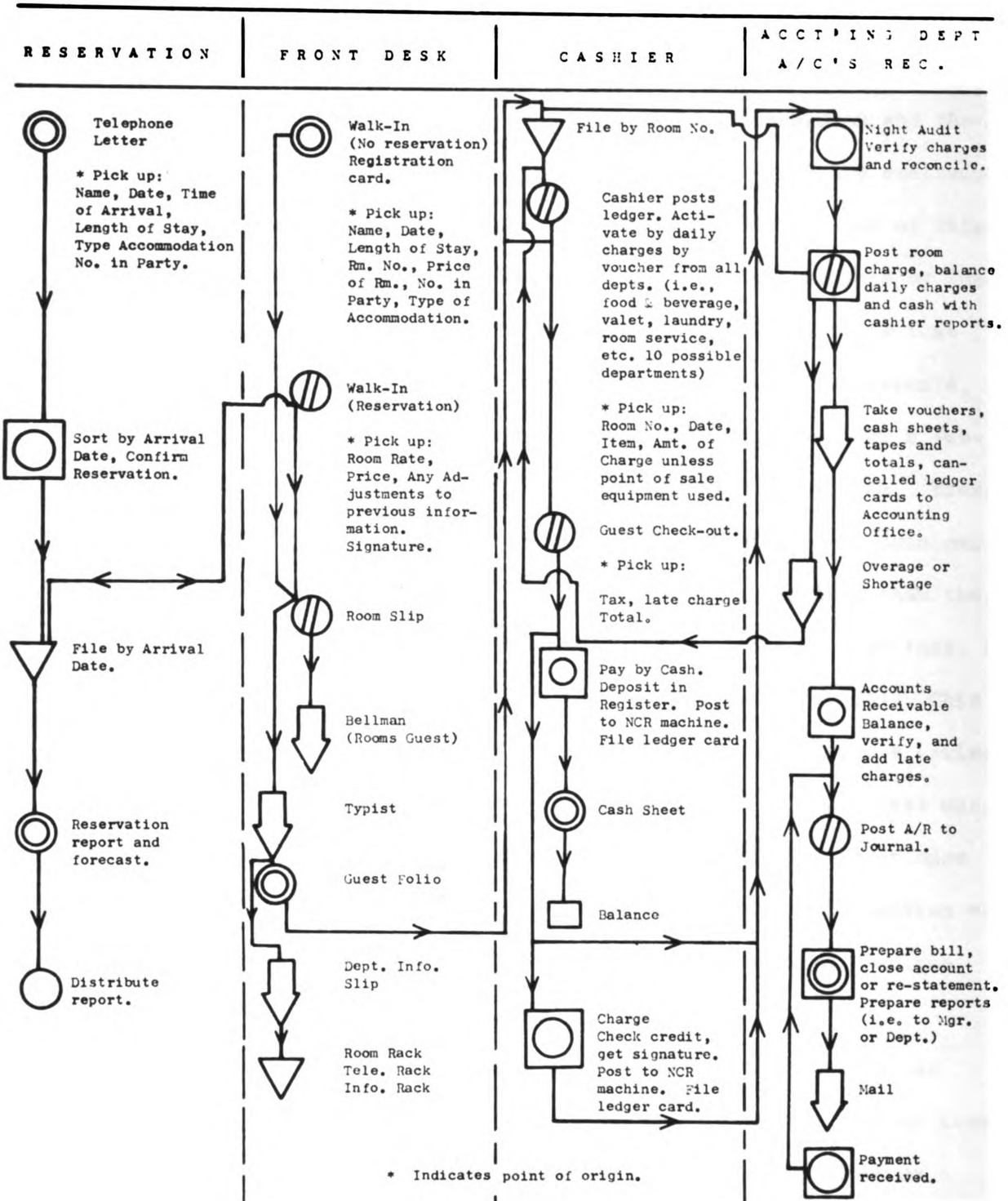
1) File
2) Post

Combined activity

FIGURE I

ROOM SYSTEM

Information Flow and Input Data Sheet



information which begins at the time his reservation is made, or he walks into the hotel, and ends at the time he leaves the hotel and payment is received. The reader may say, "What isn't activated by a guest occupying a room?", intimating the opinion that the hotel consists of one large process. This may be the case, since the isolation of a system and the establishment of its boundaries is somewhat academic due to the continuous nature and flow of information through the hotel. The dissection of this flow into specific systems is somewhat related to a size workable by the analyst or data processing group. The important consideration is that its isolation not be limited by the boundaries of existing departments, or be diverted by an apparent EDP application to a minute segment or a sub-system process without first considering the complete flow system. Therefore, if our original process hinges around the sale of a room, then our system should not extend beyond nor be limited to anything less than the direct association of the guest to that room. To further clarify this, it is probably best to suggest another system (See Figure II, p. 35). This one revolves around the purchase of a meal by the guest. Again, a series of related events in information flow are generated by this act that carries through the waiter, kitchen, store room and returns. It then continues from the guest to the cashier, through the accounts receivable section of accounting where a statement is prepared, payment is received, and the account rebilled or closed out.

A third system (See Figure III, p. 36) has as its stimulus the activation of a request for purchase. A quote price is taken for an item and it is eventually purchased for the hotel. The process continues

FIGURE II

GUEST COVER SYSTEM

Information Flow and Input Data Sheet

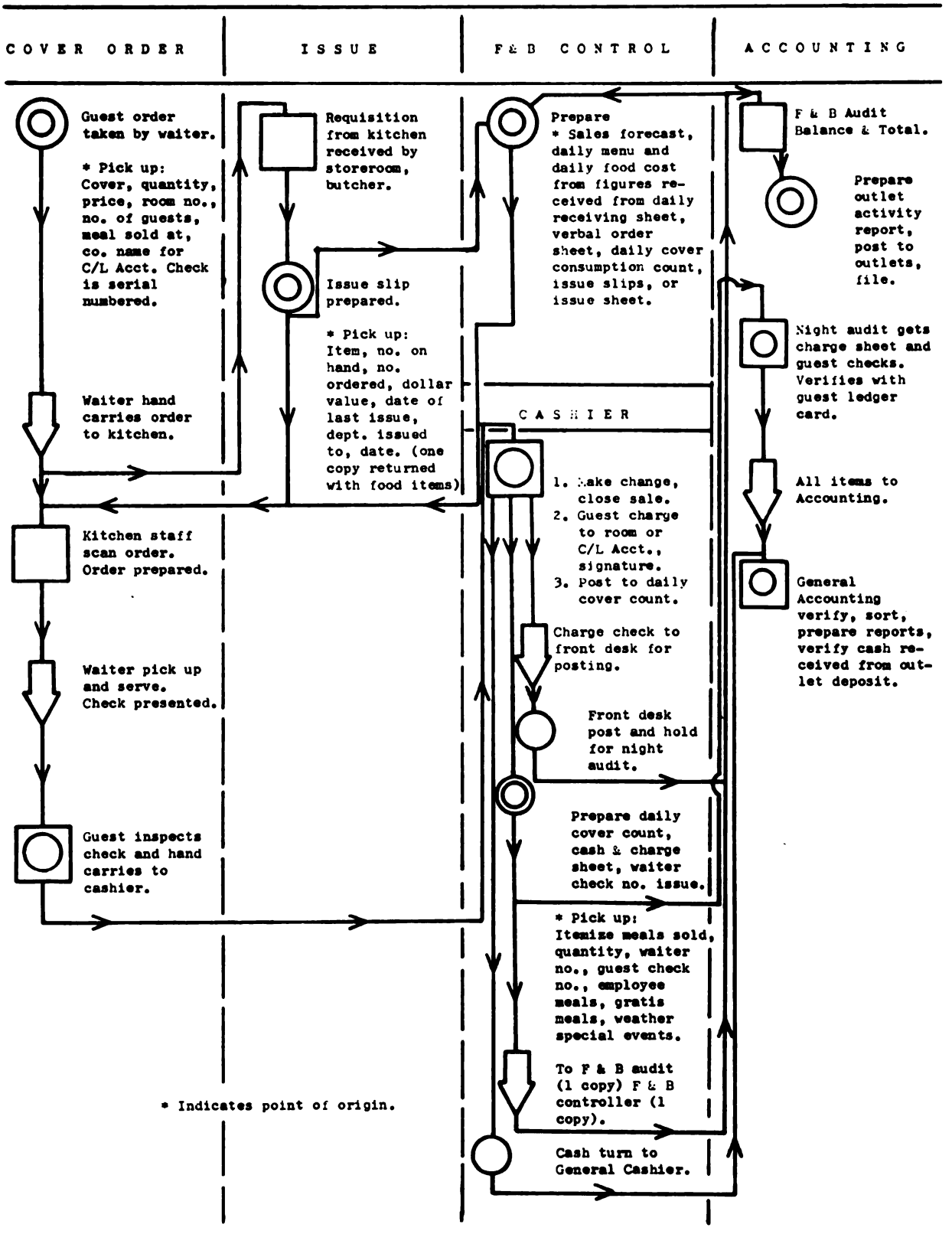
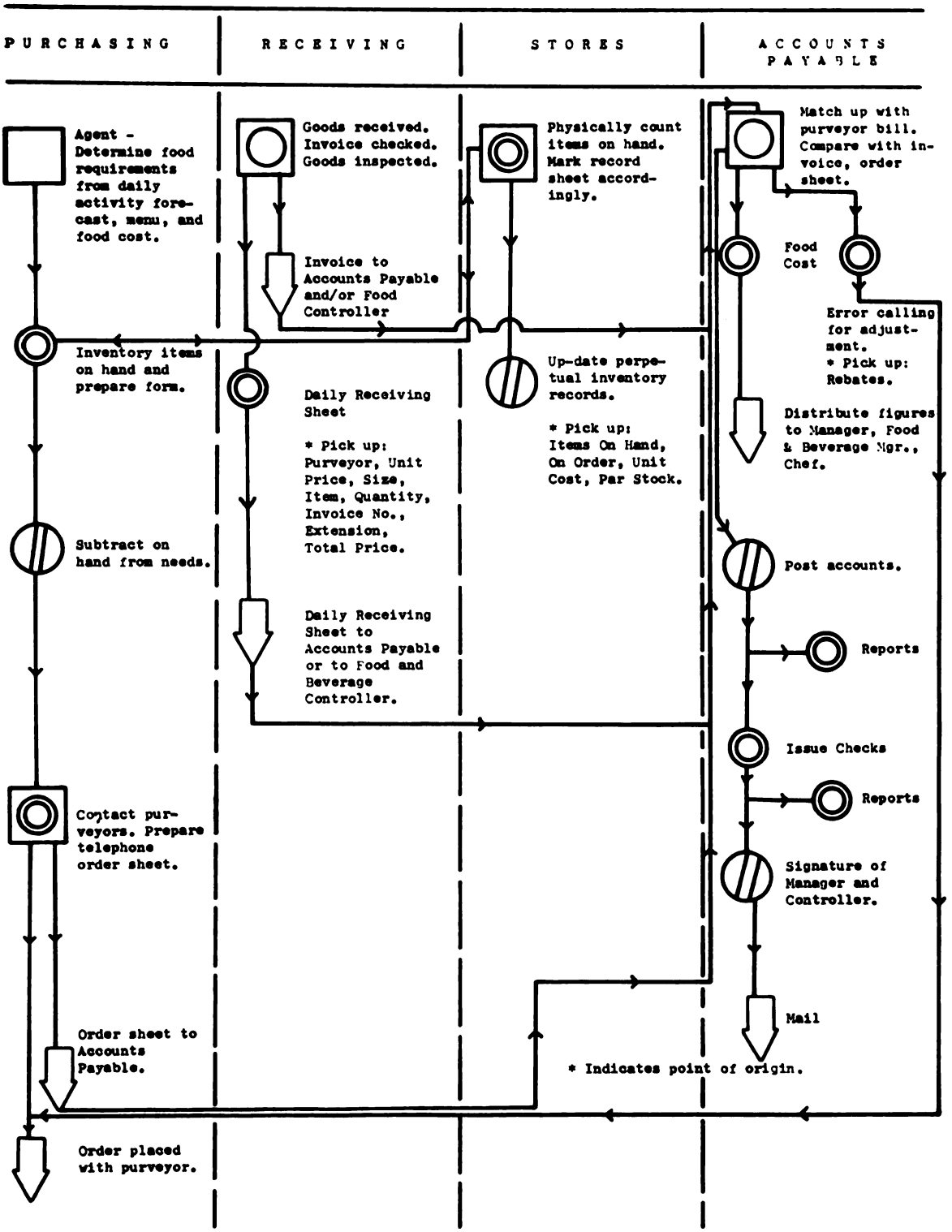


FIGURE III

PURVEYOR FOOD CONTROL SYSTEM

Information Flow and Input Data Sheet



through the administrative preparation of a purchase order, the physical receipt, storage of the commodity and the indication of the quantity and price to an inventory control journal. Payment of the purveyor's invoice completes this information system.

Two additional areas are mentioned (but not diagrammed since they are more conventional) which will possibly complete the total hotel communications flow. They are:

1. Payroll, personnel, and timekeeping control system.
2. Managerial and financial analysis (General Books included).

From a systems analyst's viewpoint, it becomes apparent that insofar as the hotel accounting function is concerned, very little input information has its point of origin within the department. One of the accounting department's primary functions appears to be to verify, check, and prevent errors in the reports which it is fed from all departments. Statistics from room count to dollars paid for potatoes must be processed by accounting with any discrepancies being carried back to the point of origin for solution and correction before further statistical accumulations are carried out by them. For this reason, there is a certain overlap in the hotel processes in which other departments encompass certain functions of the accounting department in order to complete the flow of information. Although not completely justifiable, it appears as though utilization of a "team" or unit concept, as presented by B. J. Muller-Thyn, [41] may lend itself to this

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[41] B. J. Muller-Thyn, "Practices in General Management New Directions for Organizational Practice," Part of a Report, "Ten Year's Progress in Management, 1950-1960," Journal of Engineering for Industry. Transactions American Society of Mechanical Engineers, Winter-Annual Meeting, New York, November 27-December 2, 1960. Paper No. 60-WA-59.

problem by the dissection of those portions of accounting that lie almost wholly within another system, and the placement of responsibility of these portions within that system (i.e., accounts payable to the purchasing and general stores system and accounts receivable to the rooms system). The accounting responsibilities that remain, such as general books and payroll, would continue in its present capacity along with the newly proposed data processing function. The pursuit of this thought, whether well-founded or not, leads us without the context of this discussion but serves as an example of the type of progressive management systems analysis that must be carried out to insure the success of the EDP program.

"The underlying idea here is that the system objectives are developed for the purpose of improving management. To the extent that they approach the ideal management system, such objectives may involve new paths of data flow and new processing procedures. When the complexity and volume requirements defined by these objectives so dictate, digital computers and associated equipment can be introduced as a means to extend the limits of data processing capability far beyond those which may be realized without them." [42]

Information Volumes

The establishment of the five selected systems provides the boundaries within which a detailed analysis may be conducted. Each system (cumulatively

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[42] Postley, op. cit., p. 11.

or individually) further provides a framework for the numerous overlays of information to be collected for a feasibility study.

The technique used by the advisory team in the collection of information volumes will not differ greatly from that used by the industrial engineer, methods analyst, or systems and procedures expert in performing his job. It is imperative to isolate quantities and volumes of information generated at each position on the systems chart and also ascertain its importance. Considerable help may be found by the examination of the file storage cabinets, in and out baskets, reservation cardex holders, room racks, "tickler" files for reports due, etc. The following are typical key questions and statements that would facilitate the collection of these facts.

Purchasing - How is purchasing done? (How many people can purchase for the hotel?) Number of purchases made daily, weekly, monthly, by phone, by purchase order, where each copy of purchase order goes. Number of times information is duplicated through a cycle, time element from order goods to actual receipt of item (lead time). Vendors used and frequency. Quantity of reports and forms and time required for preparation. What dollar volume is purchased monthly, by each vendor. What is the dollar amounts of rebates?

Receiving - Determine the number of items received daily by invoice, without invoice. Is information as to items received indicated by copy of invoice or on a receiving sheet? What information is necessary for each item received (i.e., purveyor, date, unit, number of items, price, extension, terms. The purveyor's name may be important to accounts payable clerk while the store room may only require date received, quantity, item name, unit price, etc., which is then given to the cost controller, food and beverage

manager, etc.). Determine the number of errors in receiving documents. Who receives goods? What guides are used in determining whether goods meet specifications? How much of it is judgement as opposed to routine? Obtain copies of reports and forms used and time for preparation of each. Isolate maximum and minimum dollar figures taken from invoices and transcribed to other forms.

Inventory - How many items are carried in inventory, and their frequency of use in catagories for food, beverage, general stores? Determine the frequency of physical inventories and what reports are produced and their distribution. Determine the dollar value of total inventory. Isolate dollar amounts required to be kept on each item. What dollar amount of food is lost? Why?

Consumption - Record the number of issues to each department. What items are ordered by par stock and how often is it done? Record the time spent in preparation of issue slips, posting of records, and completion of reports. What is the dollar value of issues to each department and the unit cost?

Kitchen - Determine the number of covers sold by outlet for each meal, a la carte, de jour. Isolate quantity and frequency of transfer of food and beverages to and from kitchen. Collect all forms required, and record time spent in their preparation. What is the dollar value of food consumed through kitchen by each outlet, food used for employee meals, and food trimings sold.

Front Desk Cashier - How many postings are required to a guest ledger? Determine the number of checks cashed and number of vouchers received

after guest has departed. Determine the volume of check-outs per day, number of errors in posting per day, time spent per posting, per check-out. Record the number of vouchers received per day, by department. What is the average time delay of the guest for check-out. Collect all reports and forms used showing distribution of each and time for preparation of each. What is the total dollar volume handled and by department?

Restaurant Cashier - What information is cashier expected to tabulate such as number of each check issued to waiters, types of covers sold, number of guests served, number of checks charged, tax, amount of each item, and total check amount? Record the number of charges to customers who are not guests of the hotel. Determine the time spent with each customer , in preparation of reports and sales sheet. What distribution does the information receive?

General Accounting - Determine number of hours spent by each employee to check incoming reports, vouchers, cash and charge sheets, cashier banks, to handle guest complaints as to charges. Record time spent in posting and preparing city ledger accounts receivables, time spent in preparation of Profit and Loss Statements and Balance Sheets. Isolate bottlenecks in billing guest and purveyors. How many vendor checks are written per month?

As previously mentioned, the majority of energies spent in today's accounting operation appear to be as a result of two situations. The numerous manual transcription errors in completing reports, and the necessity of control to prevent mishandling and missuse of hotel property

and funds. Therefore, it is indeed worthwhile to isolate and examine the time spent in this type of effort by each person in the accounting department as well as throughout the hotel. Considerable savings may be possible in their daily routines if the study can produce conclusive statistics as to effort expended in these rechecking functions. This non-productive effort may be eliminated through the use of point-of-sale input machines directly connected to some type of central process center.

Payroll - Compute the employee turnover rate and the number of employees per department and shift. What portion of the total labor effort is spent on productive output (direct labor) as opposed to clerical or administrative (indirect labor) tasks? Determine the number and type of deductions per employee, the method and frequency of payment, and the reports and forms used along with preparation time and distribution. What is each employee's rate of pay, meal, and uniform allowance? What is the total dollar payroll by department and shift?

Front Desk - Accumulate totals as to the number of guests having reservations, number of turnaways due to a full house where this condition actually does not exist, number of rates available to guests and reason for differences. Determine the maximum and minimum guest check-in time. What are the steps involved and time spent on each? Isolate information that is duplicated and forwarded to other departments. What specific information is required from each guest and from other departments?

Personnel - Accumulate job descriptions. Determine the degree of training required to perform each job, the level of education of each individual, as well as age, sex, and personal history. Collect organization charts.

Minor Departments - Record the frequency of use of Valet, Laundry, Garage etc., departments.

Reports and Forms - Accumulate a copy of all forms and reports. Analyze and isolate the origin of information. Show point of origin and distribution of all copies. Indicate whether information is transcribed or original. Show time intervals necessary to complete purchasing cycle, check-in time, indicate amount of time necessary to prepare reports, and check other reports. Determine what information is necessary from other people to complete a report. What information is originated at each position?

All areas - Determine for each above, the item maximum and average transactions or dollar amounts possible (i.e. maximum number of daily check-outs in a 1000 room hotel may be 800 guests, with an average of 300). It is also important to establish where and what types of office equipment are presently available in the hotel, as well as a listing of its serviceability. This is necessary to insure utilization of all equipment possible and determine dollar value of equipment considered obsolete. What information would management like to have that is not now available?

The study group has now gathered information in a detailed manner that may lend itself to some form of EDP system.

The following reports, forms, and records appear to be the more susceptible to EDP application:

Reservations files

Reservations computation for forecasting

Room assignment decisions

Rooms inventory status (i.e., out of order, available, etc.)

Night Clerk's reports

Guest history cards

Other room revenue reports

Room revenue forecasts

Food and Beverage sales records

Food and Beverage inventory control

Food and Beverage forecasts and analysis

Food and Beverage revenue reports

Menu patterns and popularity indices

Other reports of guest charges (i.e., valet, laundry, etc.)

Guest ledger posting

City ledger posting

Accounts receivable records

Accounts payable records

Incoming voucher reports

Inventory control

Payroll records

Payroll preparation

Cost distribution of various items above.

Monthly financial statements and statistical analysis.

Annual financial statements and statistical analysis.

Importance of Information Gathered

The next worthwhile step is to examine the usefulness of the voluminous data (outputs) generated throughout the hotel, and determine what effect it would have if these figures were no longer kept. It may be that the information is necessary and vital to the daily operations. Then the effort to collect and produce such information must be compared to its worth as a tool.

If the data still stands up under this economic test, then the final question is, "How often is it necessary?" Would it be sufficient to know that the information is available at a moment's notice? The essential information would be stored in such a manner that would enable reports to be printed out as needed or when deviation from predetermined "norms" existed (management by exception) rather than daily, monthly, yearly, etc., as is presently done.

The critical examination put to each output presently deemed necessary by management and employees, may produce quite a different operational picture. It is hoped that it will result in a reduction of the necessary information (outputs) required to operate the hotel which will, in turn, reduce the overall equipment expenditure and programming requirements. It is further hoped that it will reveal to the study group those areas where bottlenecks of information occur, where there is needless duplication of facts and figures, and where excessive time and effort is being spent in routine functions. Where this condition is exposed, these same facts and figures should also allow the systematic formulation of a similar system in which as many problems as possible in the information

flow have been isolated and corrective recommendations made to management.

Even if EDP equipment is not used, the act of going through the physical process of an analysis and evaluation of the present system, could help numerous hotels to realize substantial savings in handling information and reducing and redistributing workloads through standardization. [43]

Two immediate uses remain for the data collected. One is the isolation of those job classifications which may be most affected by EDP due to the nature of the duties involved. The second is the isolation of inputs to the system which, to a great extent, will affect the size and cost of EDP equipment.

Selection of Job Classifications Susceptible to EDP

The effectiveness of determining those job classifications most affected by EDP in the hotel lies in the ability of the study group to establish, first, which jobs are strictly clerical and routine in nature; second, which are considered "service" positions and are in existance due to the direct contact with the guest; third, which jobs are a combination of both but whose duties would be more easily done by elimination of certain written functions. This would, in turn, give the employee more time to do a better service job or would create an excess of idle time. Fourth, which positions are supervisory over one of the three previous areas mentioned. The table on page 47 serves as an example of the possible classifications affected by EDP and the degree involved.

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[43] Neuschel, op. cit., p. 279.

TABLE I

TYPICAL JOB CLASSIFICATIONS AFFECTED BY EDP

Most Affected	Somewhat Affected	Least Affected
Night Auditor	Cashier (Front Desk)	Cooks
Typist	Desk Clerk	Waiter
Payroll	Reservation Clerk	Bellman
Accounts Receivable Clerk	Room Clerk	Dishwasher
Teletype Clerk	Night Room Clerk	Maids
Reservation Typist	Mail and Information Clerk	Houseman
Rack Clerk	Secretary	Busboy
Front Office Clerk	Room Service Operator	Key Clerk
	Assistant Front Office Manager	Front Office Manager
	Night Manager	Food and Beverage Manager
	Night Catering Manager	Executive Chef
	Steward	Controller
	Assistant Steward	Auditor
	Payroll Supervisor	
	Assistant Comptroller	

It is pointed out that the possibility of a reduction in payroll decreases as the responsibility of the jobs moves from the clerical classification toward the "service" category. It is extremely difficult to realize a savings in the moderately affected areas unless the number of employees performing the same duties are decreased as a result of making each job less burdened with paperwork. Once the number of persons in this type classification is reduced to one, it becomes almost impossible to eliminate the position (i.e., a desk clerk is still necessary to make room selections and meet guests, regardless of equipment involved). Elimination of this position would be possible only through the realization of a completely automated hotel -- something to which the present day guest must become conditioned.

An accumulation of payroll dollars can now be made by the various departments (See Table II, p. 49) with allowances and reduced amounts for jobs only partially affected. The total dollars giving an indication as to the present costs of labor can be applied, in some measure, against any estimated EDP equipment expenditures to produce the dollar return on investment deemed acceptable.

Isolation of Inputs

Several approaches to the selection of basic bits of information (inputs) exist. One such approach is to select all the forms and reports centering around the basic information systems and begin to analyze each figure and heading that appears thereon. The numbers and items necessary to complete a given form give an indication as to what the information is

TABLE II

POTENTIAL PAYROLL SAVINGS BY DEPARTMENT
(Example)

Area	Large Hotel 780 Employees		Medium Hotel 440 Employees		Small Hotel 135 Employees	
	No. of Employees Affected	Weekly Payroll	No. of Employees Affected	Weekly Payroll	No. of Employees Affected	Weekly Payroll
Front Office	38	$ 2,500	19	$ 1,215	3	$ 195
Food	62	4,600	48	3,290	14	1,025
Administrative & General	47	3,500	32	2,370	12	970
Sales	10	1,125	5	850	2	185
Room Service	24	1,350	19	990	3	175
Miscellaneous . . .	6	800	5	500	1	100
Telephone	15	925	8	450	3	135
Total Number of Employee & Dollar Savings per Hotel	202	$14,000	136	$ 9,665	38	$ 2,785
Total Rooms	1,000		500		170	
% Occupancy	72		69		70	
Total Employees	780		440		135	
Dollar Value	Over 6 million		Over 4 million		Over 1 million	

used for, where the data originated for its preparation, and who receives it. (See Table III, p. 51) The analysis involves a sort of backward step by step evaluation of outputs from position to position until the lowest common factor or basic element is isolated. It further indicates just where in the sequence of operation this input is first picked up.

If the output subjected to evaluation is the dollar amount of transient room revenue as it appears on a daily night audit report, the input would ultimately be traced to the front desk where the initial determination must be made and recorded as to whether a guest was transient or not (Input 1), the room rate and number (Inputs 2 and 3), and the date (Input 4). If this were the only revenue figure desired by management each day, we could capture this information by having these four inputs recorded for each occupied room at the time it is sold, and manipulate the data automatically through EDP and produce the transient revenue information. Each space on the various forms and reports gathered is subjected to this type of examination.

Certain of the captured inputs may be usable in some combination with new inputs to produce other results so that a relatively small group of inputs are identified and isolated as to their point of origin. If these inputs are picked up and coded in some form of punchcard, magnetic tape, or electronic impulse, the inherent speed of data processing equipment could produce the desired statistics in a more accurate and timely way than is presently realized. These statistics may include areas of interest such as; forecasts, financial reports, accounting records, status of rooms, guest charges, sales analyses, and new management tools for decision making as well as provide for tighter administrative controls.

TABLE III

INPUTS - FOOD COVER SYSTEM

Initial Pickup and Subsequent Use

	Input	Acct.	Waiter	Cashier	Food Checker	Kitchen	Front Office	Food Controls	Bar	Total
1.	Date	x(1)	x(2)	x(3)			x(4)			4
2.	Waiter Number			x(1)	x(2)					2
3.	Check Number	x(1)		x(2)	x(3)		x(4)			4
4.	Location of Sale	x(1)		x(2)	x(3)	x(4)		x(5)		5
5.	Guest Room Number		x(1)	x(2)			x(3)			3
6.	Total Amount of Check Code for Gratis Sale	x(4)		x(1)	x(1)		x(2)	x(3)		4
7.	Amount of Check for Food	x(3)		x(1)	x(1)			x(2)		3
8.	Amount of Check for Beverage	x(3)		x(1)				x(2)		3
9.	Drink or Bottle	x(4)	x(1)					x(3)	x(2)	4
10.	No. of Drinks or bottle		x(1)					x(3)	x(2)	3
11.	Tax	x(2)		x(1)						2
12.	Credit Card Number		x(1)				x(2)			2
13.	Type of Cover		x(1)	x(2)	x(3)	x(4)		x(5)		5

(continued next page)

TABLE III (Cont.)

INPUTS - FOOD COVER SYSTEM

Initial Pickup and Subsequent Use

Input	Acct.	Waiter	Food Cashier	Checker	Kitchen	Front Office	Food Controls	Bar	Total
14. Number each Cover Sold	x(6)	x(1)	x(2)	x(3)	x(4)		x(5)		6
15. Guest or Employee Meal	x(4)	x(1)	x(2)				x(3)		4
16. Number of Guests		x(1)	x(2)				x(3)		3
17. Guest Name (if direct charge)	x(3)	x(1)	x(2)						3
18. Guest Address or Company Address or City Ledger	x(3)	x(1)	x(2)						3
19. Company Name to be Charged	x(3)	x(1)	x(2)						3
20. Sale at Cost or Gratis	x(3)	x(1)	x(2)				x(4)		4
	14	13	17	5	3	5	11	2	70

Through the isolation of these inputs, the first indication may be made as to whether EDP has a worthwhile application in the hotel. Is the hotel one in which there are numerous outputs generated by numerous inputs which require complex evaluations and uses of formulas, or is it one in which numerous outputs are created by the manipulation of a few inputs with complexities and delays arising as a result of the frequency and speed with which these inputs must be manually handled? The digital data processing equipment available on today's market has the greatest and most profitable application in the latter area, while the analog computer finds greatest success in the first area. The number of inputs required to be captured also determines the number of separate positions or addresses a memory unit must have in a computer system, or the number of "sorts" required on punchcard equipment to produce the information desired.

A preliminary EDP study was conducted this summer by an eastern hotel corporation. The study gave an indication that there are approximately twenty essential inputs concerned with the rooms function. It further indicated that if these inputs were captured at their point of origin as shown by the system diagram, (front desk) and manipulated electronically, approximately 210 outputs could be produced -- roughly a 10 to 1 ratio. A portion of the essential inputs for these two systems appears in Table IV, p. 54).

Identical outputs presently being used by different groups on different reports in the hotel may be reduced in number if the outputs are automatically produced on one EDP report. The report is then given

TABLE IV

ESSENTIAL INPUTS BY SYSTEMS

Room	Guest Cover	Food Purchase
1. Room Number	1. Date	1. Item name or identification number
2. Name of Guest	2. Waiter Number	2. Purchase Order Number
3. Address of Guest	3. Check Number	3. Purveyor Quote Price
4. Room Rate	4. Location of Sale	4. Quantity of Item Ordered
4a. Special Rate	5. Type Cover	5. Purveyor Name
5. Room Occupancy (single, double, twin, suite)	6. Quantity each Cover	6. Number each item on hand
6. Double Occupancy Differential	7. Price each Cover	7. Number each item in use
7. Number of nights occupies	8. Number guests	8. Minimum stock level
8. Credit Card Number	9. Amount of check for food	9. Unit Cost
9. Number of guests in party	10. Amount of check for beverage	10. Item designated food or beverage
10. Extra charges	11. Tax	

wide distribution and carries the critical information to be extracted as needed. This may be accomplished by some EDP process of reporting or by the design of new forms (snap-out type) recommended by the study group which does not involve EDP.

Summary

The preplanning function has carried management through an examination of the hotel's major goals. They have in turn selected the appropriate personnel and outside consultants to serve in an EDP advisory capacity, charged with the responsibility of critically analyzing the hotel's communication flow network. This group has established the basic information flow systems and also has shown graphically the processes susceptible to change, the jobs involved in paper handling, the interdependence of the data volumes that exist in the system, and how much it costs to operate it. They have attempted to collect all outputs, determine the operational value of each, and to isolate the basic bits of information (inputs) necessary to produce these required results. The advisory group has also initiated a well-planned employee relations campaign to prepare the employee psychologically for the EDP study. All in all, a realistic picture exists in the minds of management as to how the hotel operates today and what it costs (fixed and variable) to perform its present operation. Further, management has a picture of how they would like the hotel to function in the future and is cognizant of the fact that EDP may be applicable to the hotel situation, all things being equal. The next step involves EDP application and its justification.

CHAPTER IV

EQUIPMENT JUSTIFICATION

A discussion of the basic principles of an Electronic Computer System appears in Appendix B along with the Definition of Terms on p. 18. The information is intended to be supplementary to this chapter and familiarize those interested in the basic operating principles of EDP systems.

Any decision as to whether EDP handling of information should be employed in the hotel must evolve around four elements as applied to the existing information gathered by the study group. These elements will enable the hotel to determine what type equipment should be utilized and its size. They are:

1. Quantity of information necessary.
2. Generation of operational data.
3. Processing of data.
4. Result presentation and system response.

Consideration of these factors will of necessity formulate the first indication of how an EDP system might look and operate. It will further require a close-knit relationship between hotel management and manufacturer in the consideration of different approaches to handling detailed daily information, decision making information, and the overall establishment of operational and organizational structures. The degree of cooperation that the hotel group can give to the manufacturers or consultant will be proportional to the completeness of the final economic proposal to deal with the selected procedural areas.

Quantity of Information Necessary

The ability of any automated system to improve on a manual operation must have as one of its characteristics the capability of holding within itself the essential numbers and items presently kept in some written form. These numbers and items of concern might include, among other things, the number of different line items of inventory (i.e., 3,000 with 1,000 considered critical items), the total number of rooms (i.e., 1000), the maximum number of details required to be kept on each room (i.e., room rate, present occupant, characteristics about the room, etc.), and the various categories in which revenue is reported (i.e., transient, permanent, restaurant outlet, valet, etc., each having a daily dollar value of no more than six digits).

The sum total of these items will enable either the equipment manufacturer or the consultant to ascertain the approximate memory or card layout necessary to accomodate the hotel operation. The economic importance is twofold. One, to determine whether the hotel requirements are of sufficient volume to justify the purchase of a memory unit (drum, disc, tape) and if so, with what capacity; if not, is cardpunch equipment suitable? Second, to determine the amount of time (man hours required) necessary to convert this initial information into machine language. This "one-time" dollar amount will be utilized in the comparison of total EDP costs to present methods of operation.

Generation of Operational Data

"Contrasting with information from which the basic files (memory or

cardpunch) are formed, operational data are generated as a by-product of the operation itself. These data are generated by each occurance of the business operations they represent." [44]

A large portion of this collection of operational data has been performed by the study group in its determination of the worth of information produced on reports and forms. It has also isolated the necessary inputs (See Table IV, p. 54) required in the daily operation and also where these inputs are first picked up (point of origin) and placed in the flow stream.

Our economic evaluation must now consider whether the automation or pickup of this information by some electromechanical form is more profitable than continuing with the same manual method.

For instance, the table on page 51 indicates the waiter is in a position to pick up numerous inputs at the point of origin, yet it is difficult under the present system (manual) to expect this individual to physically operate some type of electronic slave station that would enable him to place into memory these inputs as they are collected. This limitation is due largely to the type of work involved and the individual concerned. However, it is possible that the guest check be redesigned (possibly by mark-sensing) to facilitate the pickup and transmission of the pertinent inputs by the cashier. Especially if this transmission could be accomplished by some type of "black box" able to transmit the guest charges directly to a memory drum for subsequent readout at check-out

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[44] Postley, op. cit., p. 68.

time, as well as total the guest check, itemize sales by required categories, compute tax, and make change -- a task which sounds impossible but is not far from reality.

The economic evaluation, then, becomes a comparison of costs in operating under the present guest check system with that of the proposed system taking into consideration time spent by cashier to process a sale, make corrections to checks and sales sheets (frequency of shortages and errors), competence of employees to operate both systems, expense of developing and installing the "black box" including the total number necessary. The results may be that a third method proves to be the most economical -- one in which the original data is first punched into a card or a paper tape (flexo-writer) and is then physically carried in tape form to a central area to be converted to magnetic tape for processing at a computer station. This solution may be necessary due to the adverse physical makeup of the building which would make it prohibitive to wire for a more complex system of impulse transmission.

This type of evaluation should be conducted through each position in the systems chart. The final result being an indication as to the extent of the input network necessary (card or tape) to solve the hotel problems of information transmission to a central processor. The dollar amount to accomplish this task is also shown.

Processing of Data

The processing ability of a computer or cardpunch system is of fundamental importance, since the way in which a system functions depends

on whether the hotel data handling problem is solved or not. The cardpunch system has the ability of being relatively easy to install, flexible in accomplishing simple tasks such as a payroll and other accounting functions and low in cost. However, it is restricted as to the economical size it may be expanded to. It is unable to handle exceptions within the normal machine routine, or make simple logical decisions. It must also solve complex problems in pieces or runs which are not in one continuous process. [45]

Computers vary in many respects and although basically static in capabilities, are continually being tailored or changed to meet the desires of a given customer if he will pay the development costs.

The awareness that any process may be automatically handled for a price returns the discussion to whether or not it is essential to allow for the availability of speed handling of information within the hotel system. Although it may be questionable on the basis of frequency of use, quick access to information may be advisable on the basis of customer convenience and satisfaction. For example, the difference in cost between an EDP system which provides a memory with "random access" (See Definition of Terms, p. 18) capabilities may run $5,000 more in cost than a system which provides a "periodic readout" of memory information at pre-stated intervals. (See Appendix A) The assumption is made that all other features of the two units are equal. If this prior system were installed in a

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[45] Data Processing by Electronics, (New York: Haskins and Sells, 1955) p. 113.

resort hotel or in a hotel catering to a more permanent guest, then its use by the front desk to quickly produce a guest bill at check-out time would be questionable. The preparation of a guest bill may be just as efficiently done by a "readout" system since the average length of stay in this type of hotel is longer and the check-out process may be done in a more leisurely manner. However, in a transient hotel situation, the advantage of being able to produce a bill instantaneously with up-to-date charges is obvious and the increased cost factor of having the random access feature is overshadowed by guest service.

The necessity of speed handling of information (microseconds, miliseconds) tends to surround the guest check-in/check-out procedure. Yet speed handling may be of little significance when consideration is given to total man hours spent per day in these tasks compared to equipment costs. The critical question regarding utilization of EDP appears to lie in the hotel's ability to maximize the use of central computer time and storage capacity while holding to a minimum the down-time and off-time in relation to the investment. In other words, management must avoid being oversold or talked into buying computer equipment merely to do a specific job or to meet the panic of increased competition. Conversely, equipment in operation at maximum capacity is not recommended. Some excess capacity is healthy since this will allow for unexpected down-time and expansion of the business as well as to provide for "such contigencies as peak loads, moderate increase in normal loads, development of new operations, a reasonable number of unforeseen special projects, and finally, reduce

equipment unavailability due to engineering causes as well as errors committed by operating personnel." [46] Idle time (slack time) on a computer in terms of dollars is much more costly than idle people doing the same job. This fact may be quickly brought home when one considers a small IBM 1401 computer leases for $7,500 per month or approximately $45 per hour. [47] Two hours slack time daily would easily pay the wages of several people who could be used to perform numerous additional duties.

Presentation of Data and Its Response

Just as the analysis of inputs is necessary to determine the size of a memory unit and point-of-sale equipment, so is an analysis necessary of what is to come forth from the EDP system (outputs). The examination by the study group of the worth of the various reports and the figures appearing thereon will answer such questions as: 1) Will percentages serve where figures now appear? 2) Are figures showing last years actual sales to date as well as a yearly budget to date both essential on a daily sales report? This type of introspection will help establish what information is really needed to run the hotel, what form it should be presented in, and how frequently. The optimum daily report would include only those items essential to daily operations, such as deviations from predetermined "benchmarks."

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[46] Postley, op. cit., p. 72.

[47] Adams Associates, op. cit.

In many respects the presentation of the information from an EDP system is in the eyes of its users, the only judge as to the worth of a data processing system. In the same vein, hotel people, as well as people in all industries, "are unaccustomed to accepting summary information from machines without receiving the detail information to support the summary. They are not 'machine oriented' ." [48] Therefore, the ability to accurately condense the present day information into essential requirements and needs in a format acceptable to all can be extremely difficult to accomplish. It may result in the acceptance by the study group of the information and format as it is presently displayed in hopes of future changes with the gradual transition to EDP.

The economic value of determining the information format is somewhat obvious since any type of data processing system must carry with it the "hardware" necessary for an output display which is preceded by the proper computer and tabulation manipulation.

The solutions to the four basic elements discussed above have given to the study group or consultant an indication as to what the hotel desires in terms of information necessary and in what form. It has also determined the volumes of information that must be stored and handled to accomplish the operational and marginal tasks. The group is then prepared to approach a specific manufacturer to ask him to fit these requirements to specific types of hardware and provide some indication as to the amount of capital investment required to accomplish the transition to EDP.

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[48] Postley, op. cit., p. 72.

The result may be the presentation of several solutions by the manufacturer based on the hotel size, financial capabilities, time requirements, and desires. A discussion of four such equipment possibilities appears in Appendix B.

The remainder of this chapter will touch upon several additional equipment factors that may be encountered by management.

Additional Equipment

So far, the discussion has dealt with the consideration of the central computer and input/output equipment. It is necessary to include along with this the requirement for obtaining peripheral equipment which is not normally included in the basic package price but which is necessary for the operation. Requirements for this equipment might be as a result of a need for a special device to transpose the medium of input information from punched cards, normally handled by the equipment to punched paper tape. This would require an additional rental charge for a paper tape reader. It suffices to say that the hotelman must become aware of each "systems package" makeup, and the additional charges for extra equipment if and when it is necessary.

Lease vs Purchase and Use of Computer Service Center

The question as to whether the hotel should lease or purchase the electronic computer system is not one the individual hotel of less than 1,000 rooms need worry about. The apparent lack of individual application for these hotels, thus far, (based on known equipment costs, and potential

economies available) means that neither purchase nor lease is worthwhile. There is a possibility still that a punchcard system or the rental of time from a computer service center may be feasible.

The service center is normally owned and operated by a manufacturer of EDP equipment. The wide range of equipment available along with experienced personnel makes the service center a possible answer to the small hotel which cannot justify purchase or lease of equipment but whose operation can benefit by EDP usage on a "per job" basis. Data are taken to the service center location and charges reflect the actual "use time" of the equipment.

For the large chain and large individual hotel capable of the utilization of punchcard equipment by virtue of information volume handled, the question of lease or purchase may be relevant. The considerations are those dealing with tax advantages, if any exist at time of delivery of equipment; management policy of fixed asset acquisition, which may mean purchase of equipment if an increased cash flow situation is especially desirable; availability of capital, which must include the price of money weighed against an appraisal of future economic trends. [49]

One point should be kept in mind that is often overlooked; that is, the fact that the lease price of any EDP equipment is normally based on an eight hour shift operation with approximately a 50% [50] increase in lease price for each additional shift required. The lease quote first seen for

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[49] Wallace, Frank, Appraising the Economics of Electronic Computers, (New York: Controllership Foundation, Inc., 1956), p. 61.

[50] Ibid., p. 64.

equipment to be housed in the hotel may be misinterpreted as being a total fixed price. Anticipation of a two or three shift operation may result in a significant cost advantage in outright purchase of the equipment. Otherwise, leasing should provide the economic flexibility necessary.

Equipment Obsolescence

Of equal importance in the economic evaluation of electronic data processing equipment is the obsolescence factor. The recent changes in equipment design from vacuum tubes to equipment which is completely transistorized is but one example of the rapid progress made in the electronics field. This one change has "enabled savings up to 50% in floor space while reducing air conditioning and power demands to 10% of the previous models." [51] The Minneapolis-Honeywell H 800 (1960 model, completely transistorized) is six times more powerful in terms of memory capabilities and is half the price of its predecessor, the D 1000 (1957 model). How then should a hotelman look at this problem? Electronic equipment is not obsolete as long as it does the particular job economically. Better use of this equipment by improved operating techniques may more than offset future technical advancements. This philosophy does not hold forever. ". . . the real danger is not that your equipment will become obsolete, but that you will let humans interpose themselves in the information flow of your business, and thereby slow the entire system down to their particular speed." [52]

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[51] Curry, Robert B., "Facilities for a Large Computer Installation," Advanced Management Magazine, Vol. 23, No. 1 (January 1958).

[52] DeHart, John, "Should I Have A Computer," U. S. Investor, May 2, 1959.

One-Time Costs

If there are real savings to be obtained, or at least anticipated as a result of an accurate study, the one-time costs are relatively unimportant. Eventually, the amortization of costs will end, but the system savings will continue. [53] However, where these savings are not clear, which is more nearly the case at hand, the accuracy of these costs becomes more important to prevent equipment acquisition where savings are submarginal. Programming, installation, and parallel operation costs represent this type of one-time expenditure.

Programming. Costs for programming any type of EDP system may be grossly underestimated by a study group. The task involves the preparation of detailed equipment information flow charts and block diagrams, the organization and proof of the numerous machine "orders" necessary to complete even the most simple addition, subtraction, or comparison. The process is a complex job which requires highly skilled, well paid programmers. It must not be forgotten that in the case of computers, the memory system has its own internal way of handling information that requires translation of the input media whether it be card, tape, or impulse. This translation is done by means of "edit" orders which must in turn be reversed and duplicated for output requirements. Once these edit orders, command orders, codes, tags for locations in memory, and sub-routines have been defined and

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[53] Stanford L. Optner, Systems Analysis, (Englewood Cliffs, N. J.: Printice-Hall, Inc., 1960), p. 143.

"proven" by means of actual performance in a controlled situation, the problem is said to be established and "debugged." Then the actual conversion of information can take place. As a rule of thumb, these costs generally equal the rental price of the equipment for one year. [54] This guide is especially true in situations in which the business application (such as in a hotel) is new and equipment manufacturers are unable to rely on past programming experience.

Installation Costs. These expenditures again will vary widely from hotel to hotel due to such problems as space availability, air conditioning facilities, electrical wiring (especially if point of sale equipment is used), humidity and dust control, raised flooring for the maze of interconnecting cables. In situations where the hotel is yet to be built, these costs may be reduced appreciably. Installation costs for a medium size computer system will approximate $15,000-$20,000. [55]

Parallel Operation. Installation costs may include the expenditure of funds for simultaneous operation of the EDP system and the manual operation during the initial conversion period. This one-time cost may involve a sizeable dollar amount in those situations where complex equipment may require a lengthly installation and debugging time. The amount is best estimated by the consultant or manufacturer.

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[54] Quoted as result of interview with Norm Statland, Vice President, Adams Associates, September 1960.

[55] Ibid.

Recurring Costs

Recurring costs are those which will be sustained to operate the system after it has been established. The equipment lease or purchase price will generally be the largest dollar amount in this category. The total purchase price for cards and tabulating paper may be small but should be included.

Maintenance cost is a recurring expense factor which can generally be avoided by a contract with the manufacturer to provide such a service. The expense of a service contract is far overshadowed by the immediate availability of men who know the equipment and its peculiarities.

The requirements for operating personnel to carry on the EDP function remain fairly stable in numbers (See Table V, p. 70). The clerical wages necessary to attract and keep competent people in these classifications appear to be higher than those presently being paid in the hotel. (See Table VI, p. 77) The salary requirements shown for Systems Analyst and Programmer in Table V may fluxuate with the individual's experience and availability since this type of background requires the greatest amount of technical skill. Either type of system (computer or punchcard) may require a sizeable complement of personnel available in these two classifications. This is especially possible at the outset of the data processing installation since, in all probability, application will be made to those portions of the communications system which are more easily accomplished and provide for the greatest and quickest economies. This would leave the majority of the more complex areas to be enveloped as the operating group becomes more proficient at the technique of EDP programming.

TABLE V

OPERATIONAL PERSONNEL FOR AN ELECTRONIC DATA PROCESSING SYSTEM

Computer Minimum Requirements [56]

	Title	No.	Rate of Pay
1.	EDP Supervisor	1	$650/mo. up
2.	Console Operator	1	500/mo.
3.	Tape Changer	1	500/mo.
4.	Tape Librarian	1	400/mo.
5.	Peripheral Equipment Operator	1	350/mo.
6.	Programmer or Systems Analyst	2-6	500 to 800/mo.
	Total	7-11	$5000/mo.

Punchcard Minimum Requirements [57]

	Title	No.	Rate of Pay
1.	Supervisor	1	$550/mo. up
2.	Key Punch Operator	1-3	350/mo.
3.	Machine Operator	1	400/mo.
	Total	3-5	$1300/mo. *

* Up to 1000 room hotel.

[56] Figures supplied by Minneapolis Honeywell, Tom Oheir, Boston Sales Manager, EDP Division.

[57] Figures are for IBM Series 50 equipment with calculator and 403 supplied by IBM, Steven Clarke, Sales Representative, Boston.

Return on Investment

The study group must then proceed to evaluate these expenses (one-time and recurring) and determine if, within the hotel(s), there is sufficient monthly savings based on payroll and volume analysis to offset the equipment and payroll costs. Numerous comparisons are possible, but today's managers appear to be most impressed by the rate of return on the investment or lease. By application of the total anticipated increase in profit, which is the payroll savings, along with equipment and material savings (i.e., fewer typewriters, NCR posting machines, forms, etc.) to the purchase or lease price of equipment, it is hoped that the capital investment can be recouped within a reasonable period of time [58] and/or the lease price offset to show an acceptable profit.

This comparison is a difficult task and one that may produce a condition where adequate savings are not possible, in which instance there is no alternative but to forego EDP. It may produce a typical "no-relief" situation. That is, there is no real offsetting dollars to balance against the costs to be incurred by establishing the more desirable EDP system. [59] In the sample solutions, (Appendix A, Approach I) it is apparent that this condition may easily exist in any individual hotel where EDP equipment, at a lease price of $4,500 per month, is applied to a limited function which

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[58] Wallace, op. cit., p. 61

[59] Optner, op. cit., p. 143.

may at best save something less than this amount in current payroll and expenditures per month. The main problem is that not all positions susceptible to EDP can be eliminated.

Intangible Savings

What further justification might be used when there is an apparent marginal line of profit to be realized? Intangible savings (or benefits) which may or may not carry a dollar value may strengthen the arguments for EDP if they are carefully analyzed.

The difficulty of using these benefits in a financial justification for EDP arises in the accessment of a dollar savings that may be attributed to the intangible. Such elusive areas as ascribing a dollar value to: 1) a purchasing or competitive advantage gained by having reports and statistics more timely and accurate; 2) the anticipated growth in the hotel's operation which would be favorably assisted now by the implementation of an EDP system at a less. This may be done with the expectation that a ceiling can be established that would prevent the normal growth of variable costs with a growth in size.[60] 3) There may be an advantage unionwise and taxwise in the conversion of variable payroll costs to fixed capital costs through use of an EDP system. This might mean fewer lost time accidents, better insurance rates, and fewer union grievances, but to what extent and in what amount? 4) Faster handling of information in a hotel may mean

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[60] C. Northcote Parkinson, Parkinson's Law, (Cambridge, Massachusetts: The Riverside Press, 1957), p. 12.

more business, but how much? 5) There is a possibility that priority handling of information could be eliminated by EDP since preferential treatment is usually an outgrowth of the slow or voluminous manipulations of routine situations. [61] 6) A comptroller of a large midwest hotel feels the tangible advantage of their IBM punchcard system is in the realization of payroll savings. He felt that equal importance should be given to the intangible advantages of increased job satisfaction among personnel through elimination of many repetitive routines and overtime requirements. The punchcard system further creates a more organized day with fresher, cleaner working conditions, at the same time proving the ability to create management reports which are accurate, timely and presented in a standardized way. [62]

Often the attachment of a meaningful savings to these intangible benefits are so illusive that management, unless it is already convinced to utilize EDP due to some other factor (competition squeeze), may not be convinced of its worth on these facts alone. However, this cannot be presupposed and the necessary effort must be expended to ascribe some type of dollar value to these benefits especially when the tangible savings are marginal. In the long run, it appears that these intangibles (such as the six mentioned above) are the real rewards to be experienced through EDP and not the direct dollar savings. [63]

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[61] Postley, op. cit., p. 70.

[62] Interview with Frank A. Mikos, Auditor, Palmer House, Chicago, Illinois in September, 1960.

[63] Postley, op. cit., p. 7

Hidden Economic Pitfalls

"The ability to demonstrate actual dollar savings is the most devastating test of an EDP system which has been avowedly designed with this as the sole criterion." [64]

Care must be given when indicating a dollar savings possible through EDP. The savings may be directly attributed to the improved method of handling the information which would occur whether EDP is utilized or not. With this type of savings available without EDP, it might be advantageous to forego EDP at the present time. This would enable the hotel to continue the hotel information examination in order to mold the necessary framework of standardization of operation so essential to any future application of EDP.

A questionable utilization of EDP that often occurs is in the application of a system to an economically unsound area in order to gain as much programming experience as possible and, with time, expand the operation into other marginal areas. The chances of success by this method are directly proportional to a continued growth of hotel business; upon the sincerity of management to see such a long term program through while faced with the absorbtion of the equipment expenditures over an undetermined period of time; and upon the ability of the EDP personnel to apply EDP properly to the "grey areas" of the hotel.

Business experience will confirm that failure to realize expected efficiencies through EDP can often be attributed to its application to only

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[64] Optner, op. cit., p. 145.

a segment of an information system. The greatest potential for economic rewards lies in the greatest possible application of EDP to the complete hotel communication system. Successively smaller applications to a single information system or sub-system may require less capital for installation but will mean an even greater reduction in the savings which may have originally prompted the purchase of the hardware. If the EDP program is justified economically (intangibles included or not), and if it is financially advantageous for the hotel to proceed slowly, it should be unquestionably understood by management that a realization of the economic goals which prompted the venture can only be realized with the conversion of the entire communications program or at least extensive enough to include one of the five or six information flow systems. Violation of this principle generally means that paperwork "bottlenecks" are merely relocated and "floating problems" are created. Example: It would be difficult to economically justify EDP to handle guest ledger cards alone for the purpose of collecting and analyzing guest histories when, for an additional sum of money, the breakeven point might be realized by enlarging the process to its logical systems flow (See Figure I, p. 33) which would include the entire guest check-in process.

An evaluation of equipment costs as presented by the manufacturer may show whether the prices included a heavy research and development expense. Several manufacturers should be called in to give a quotation on the hotel communication specifications. It is worthwhile to select those manufacturers who have installations of their equipment in businesses similar to the hotel. This may insure a better application to the hotel

problem since in all probability, certain groundwork need not be duplicated and costs incurred would be primarily for equipment modification at a marked reduction. In this same respect, the hotel may endeavor to utilize its own existing equipment (i.e., attachment to NCR posting machine to produce a paper tape) and communication transmission networks.

Hotel Payroll and Its Relation to EDP

A recent study by the Bureau of Labor Statistics (See Table VI, p. 77.) shows that the hotel industry (year-round) is below the average weekly earnings of the majority of other industries. This situation exists even though the yearly rise in wage rates from 1958 to 1959 has increased at a rate approximately commensurate with other industries.

It is an awareness of this low payroll situation in the minds of hotel management that may provide the very stimulus for the defeat of any preliminary EDP installation proposal. Any type of economic justification on the basis of personnel economies must necessarily use present day low payroll figures which, when compared to equipment costs, may not yield the percentage of return on investment management feels is necessary thereby defeating the plan. It may require additional time and possibly competitive outside pressure to cause sufficient management realization that this disparity of wages in existance between other groups of working people and the hotel employees cannot endure. It is difficult to believe that twenty and thirty year employees who have miraculously survived a depression and inflation, and done so on minimum wages, will work until they are ninety. It is just as impossible to expect a young person from today's environment to be satisfied with the same wage condition. Change may be inevitable, union or not.

TABLE VI

GROSS HOURS AND EARNINGS OF PRODUCTION WORKERS [65]

INDUSTRY	1960				Annual Average			
	September [66]		August		1959		1958	
	Average Weekly Hours	Average Hourly Earnings	Average Weekly Hours	Average Hourly Earnings	Average Weekly Hours	Average Hourly Earnings	Average Weekly Hours	Average Hourly Earnings
Hotels, Year-round [67]	39.8	1.23	40.2	1.22	40.2	1.18	40.0	1.13
Wholesale Trade	40.5	2.31	40.5	2.31	40.3	2.24	40.1	2.17
Retail Trade (except eating & drinking places)	37.6	1.82	38.3	1.81	38.1	1.76	38.1	1.70
Manufacturing - Food & Kindred Products	41.3	2.15	41.2	2.15	40.8	2.10	40.7	2.01
Manufacturing - Electrical Machinery	40.1	2.32	29.9	2.30	40.5	2.22	39.6	2.15

[65] U. S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, December 1960, Vol. 83, No. 12, "Contract Developments Schedule in 1961," Work Experience of the Population in 1959," "Bay Levels for White Collar Occupations," (Washington: Government Printing Office, December 1960).

[66] Preliminary

[67] Money payments only; additional value of board, room, uniform, tips not included.

Summary

The study group with the help of the consultant, can now make an equipment recommendation to management by following the above described procedure. Any hotel considering EDP should have the problems to be solved well defined. The possible solutions to the communication flow specification have been outlined in detail by several manufacturers and their recommendations have been carefully analyzed for detail as to timing, equipment, and the costs supporting each. Management, along with the study group, has made the necessary comparison between anticipated costs and potential savings and has come up with the optimum EDP solution to the hotel information handling problem which provides for the necessary return on investment. It may be that EDP is best applied by a single large hotel or cumulatively by a group of hotels, or it may mean the utilization of a computer service center by the smaller hotels.

If conditions are favorable, a purchase or lease contract is negotiated for equipment (computer or punchcard). In those areas where the potential savings are questionable (marginal), possibly additional evaluation time must be expended to determine whether it is best to delay EDP or to take "the risk" in hopes of future financial rewards and a better competitive position. Regardless of the decision, the continued examination of the hotel processes should be made to either insure maximum preparation for the immediate utilization of the new equipment or to insure continued efficient standardization in the hotel which may lack sufficient information volume at present.

CHAPTER V

SUMMARY AND CONCLUSIONS

The American business world has recently undergone numerous changes brought on by governmental influence, business competition and by various technological discoveries. The numerous technological changes have been met by the majority of businessmen with certain reluctance as being too radical. This reluctance was possibly brought on more by fear than any other factor. Generally speaking, through the efforts of the more progressive businessman, these technological developments were examined, proven, and eventually accepted by all.

This forward technological progression, while enhancing the overall growth and development of our business world through better methods of doing things, has also brought with it a never ending problem of maintenance of a desired profit in the course of increased output or service. There appears to be no consistent way of "freezing" the break-even point indefinitely while increasing the product or service volume. Competition, growth, and the complexities of business demand new management methods and types of equipment to solve this problem.

One such technological tool presents itself to the business world of today -- Electronic Data Processing Systems (EDP). Although its application to various segments of the business world are not proven, other segments, such as governmental agencies, insurance, and banking institutions have found it beneficial. EDP may be the deterrent to the rise of fixed and variable expenses that appears inevitable in a growth situation. It

may be the tool that will enable specific segments of our business world (hotels) to reduce or stabilize creeping costs, produce a more economically sound structure to meet competition, and allow a sharper focus on customer satisfaction.

This study has shown how to apply the planning principles of those agencies and businesses currently utilizing some form of EDP to certain defined segments or departments of the hotel which are peculiar to innkeeping. The remaining segments or departments of the hotel were touched on more broadly. The result is a presentation in a layman's fashion, of the steps a hotelman should go through in considering the feasibility of utilizing electronic data processing equipment as a possible management tool.

This report is given not necessarily as a singular possible approach to a solution for the "profit squeeze", but as an attempt to dispel the fears a hotelman may have that EDP is too complex or too expensive to consider for any situation. It is also intended to point out to those who have transcended this psychological resistance that a systematic caution is necessary in planning for EDP and that it is important to internally select an EDP team and engage a qualified EDP consultant to assist in this planning. Such a group, carefully guided by the consultant, can then deal with the specific areas susceptible to EDP, isolate the present and future hotel goals and objectives, and examine the communication flow systems. Each step of the evaluation is an attempt to determine sources of information, critical data, and the time and cost required to produce the results.

The completion of this examination phase of the feasibility study means that the various EDP manufacturers are in a position to apply their

specific "hardware" to the communications model to answer the desired information handling systems.

The final step is to consider the economic aspects of each equipment approach by comparing costs of the present manual operation with the expenditure necessary to operate the EDP system. The resulting economies may be appreciable, marginal, or prohibitive. However, it is only through a combined effort on the part of the hotelman, consultant, and manufacturer that assurance can be given that the numerous EDP pitfalls will be avoided and that if EDP equipment is selected it will be the answer the hotelman needs in view of his future objectives and financial limitations. Regardless of the outcome of the feasibility study, the decision should not be to forego EDP completely. Rewards may be gained by a continual systems flow examination. The continued and necessary standardization of operation may enable the application of EDP at a later date when other factors (i.e., equipment cost, communications volume) are sufficiently brought in line.

In the eyes of the hotel industry, payroll expenditures are excessive. Yet by comparison to the business world, the hotel pay standards are low. EDP, if properly preplanned and utilized, may provide a means whereby certain economies may be forthcoming. Economies such as these may be returned to the employee in terms of improved wages and fringe benefits, may be shared by management in the form of desired return on investment, and given to the guest through improved convenience and personal attention. It cannot be assumed that EDP is the sole answer to hotel short and long term goals, but it appears to be a logical consideration by progressive management in their attempt to improve competitive position and customer satisfaction.

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APPENDIX

APPENDIX A

COMPUTER SYSTEM OPERATION

Computer systems on the market today may vary widely in cost, speed, accuracy and realiability. However, their basic makeup is similar. The information given below is a summary of information gathered through an interview with a representative of Minneapolis-Honeywell Corporation and a condensation of a chapter on computer operations from Appraising the Economies of Electronic Computers by Frank Wallace.

Three outstanding characteristics differentiate electronic computer systems from all other types of office equipment:

1) They operate at an extraordinary high speed.

2) They maintain a high degree of operational accuracy.

3) They provide reliability or freedom from breakdown.

Present day electronic computer systems fall into two general classifications. One is the analog system; the other is the digital system. The major number of applications to business situations fall in the latter classification, more specifically with the use of general purpose computers as opposed to the special purpose type. The special purpose computer processes specific applications or similar problems. The basic program is built into the hardware and variations are limited.

The general purpose digital computer can be applied to any problem of any kind provided it can be logically broken down. It is also more flexible. However, it must be directed in more detail as to how it is to process a program, and generally has some type of internal memory feature.

Central Processing Unit

The central processing unit (See Figure IV, p. 90), also called the main frame, of a digital, general purpose computer consists of four areas; memory, arithmetic, logical, and control.

1. Memory has the ability to retain information until cleared or replaced with other information. The ability to hold this information may be contained within the unit itself(internal) which is normally limited, or contained with almost unlimited supplemental external tape, disc, or punchcard units. The internal memory can be of a drum or magnetic core type. The magnetic core is widely used and has the greatest capacity, excellent access time, and is fairly high in cost. The magnetic drum has good capacity, moderate access, and moderate cost. The economies, or cost per digit stored and extent of the internal or external memory, is determined by where the strength must lie -- in access, speed, or in capacity. Three types of information are retained in the memory unit during processing. There are the instructions, constants, and work area results.
   a. Instructions are made up of the operations component, which tells the computer what to do, and the address component which tells the computer where to find the information on which to perform and where to place the result. As for example, the coded instruction would say, read a certain figure in memory, add a certain factor and place it in a certain location. This type of instruction is called a multiple address. Single and double addresses are in existance also. Memory locations are designated in the computer by fixed or

FIGURE IV

ELECTRONIC COMPUTER SYSTEM

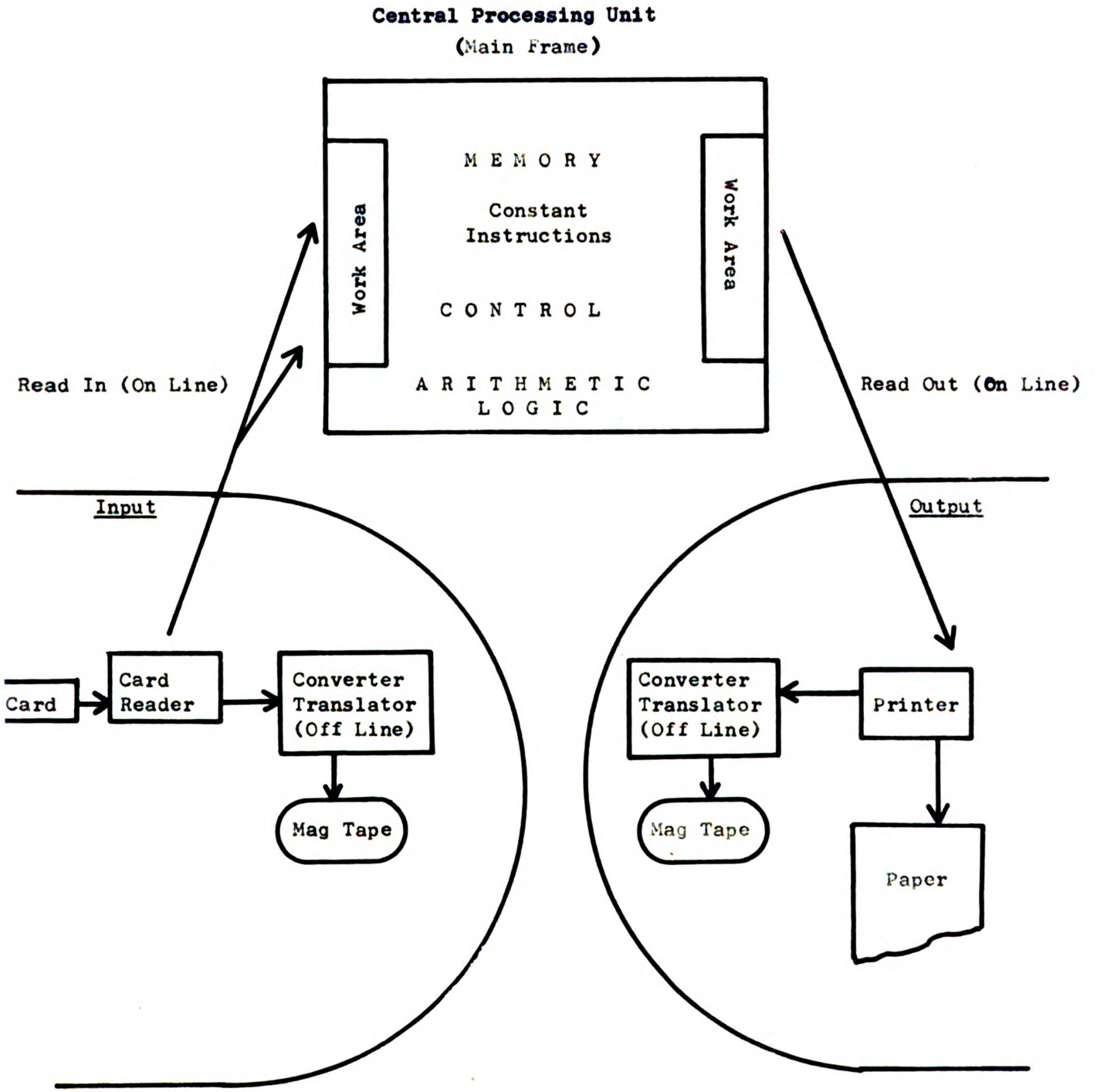
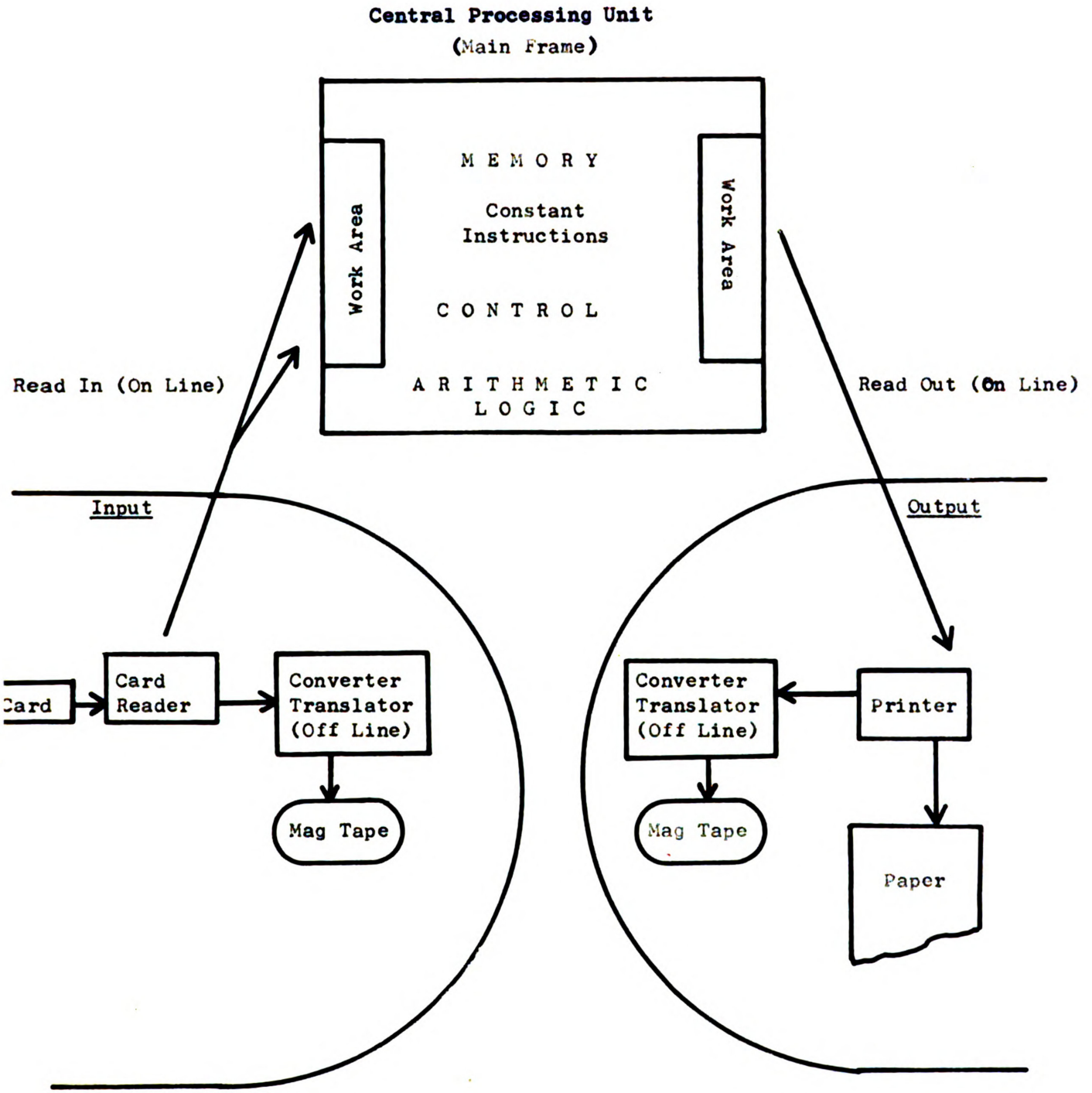


FIGURE IV

ELECTRONIC COMPUTER SYSTEM



variable words depending on the type of equipment. If the word length is fixed to a certain number character, then the location is referred to by word code. If the word length is variable, then the code must refer to the specific characters or memory positions which go to make up the information in the variable word. Size of the word is dependent upon pre-established signals to the computer. The fixed words are usually of sufficient size to allow for at least four decimal digits, three alpha-numeric digits and five octal digits. Minneapolis-Honeywell has a forty-eight bit word size. If the fixed word is not filled, it is in a sense wasted. In the variable word length situation, the digits can be "packed" so that maximum utilization of internal memory is possible. It requires a slightly more complex addressing system for locating specific words.

b. Constants are placed in memory before processing begins, but nevertheless are part and parcel of the particular program to be run. Such figures as a 1% state income tax factor required for payroll deduction would serve as an example. As an employee's pay is being computed, the memory at the appropriate time would divert from the sequence to the constant location factor as directed by the instruction and perform the necessary calculation.

c. Work area results. The work areas in memory may serve as a buffer zone for the accumulation of data to be read into the specific memory locations, or may serve as an area where information is accumulated for further manipulation or for eventual readout. In a three address instruction, this would be the third part indicating where in the work area the result of the preceding two parts should

be placed. The process whereby information from various imputs are transcribed from card or tape into computer language and reversed at time of readout is conducted by means of "edit" orders. These orders can often be facilitated by placing the entire program on a tape to handle the payroll, for example, which can be easily fed into the machine prior to the processhg of the actual raw information. This preprocessing is called "housekeeping" the computer. These program tapes for the more routine edit operations as well as other programming operations are available from the manufacturers thus saving considerable time in initial programming costs. They are called by various names -- Minneapolis-Honeywell uses the term, "EASY," (Efficient Assembly System); IBM calls it, "FORAND,"; Remington Rand, "COBOL," (Common Business-Oriented Language).

2. Arithmetic portion of the computer process will add, subtract, multiply, and divide automatically and place answer in specified location.
3. Logic. The logical section is capable of making certain types of simple logical predetermined solutions. An example would be the reading of a recorder situation in inventory. The logical section determines if a number is either more or less, larger or smaller, or plus or minus, and then indicates either that an order should be written or that there is an error. This is the type of simple human-instructed decision or solution that a computer is able to do accurately and quickly and from which it derives a great deal of its power. It is obvious that the success is contigent upon the accuracy of the human pre-instruction.
4. Control Section. The control point of the operation is at the console section and is directly responsible for the reading and interpretation

of instructions. It acts upon the operation and instructions portion of the address. Once the "housekeeping" function is performed and the programs read into the computer, the computer is then ready to process a problem. The control unit reads and interprets the first instruction, computer performs operation, control unit reads second instruction, etc. Instructions are read sequentially until a test instruction refers it to a different location.

APPENDIX B

FOUR ELECTRONIC DATA PROCESSING EQUIPMENT APPLICATIONS

The application of each of these proposed systems is hypothetical and the dollar amounts shown for any specific hotel would require considerably more detail for absolute validity. There are numerous approaches possible and it is not the intention of the writer to leave the impression that these are necessarily accepted by the persons providing the information as being the most logical. The intention of this paragraph is merely to show how a consultant and/or study group might go about applying the equipment to the hotel communication flow problem, leaving the decision of selecting the most feasible approach to management.

General Information

1. Approach I might be suggested for an individual hotel falling in the small, medium or large category (010 to 2000 rooms); Approach II, III, or IV, for several large individual hotels (1000 rooms up) in one area or for chain operations (comprising smaller hotels but totaling 6000 rooms or more). Hotels not falling in these categories may consider service bureaus or joint ownership of equipment by numerous local hotels and motels.
2. The method of input pickup is the biggest problem. It may be accomplished on any one of the following media:
   a. Embossed cards - static information preprinted with variable information marked as required.

b. Punched paper tape - produced by placing attachment on existing equipment at point of origin. (i.e., cash register).

c. Prepunched cards - Kimbal cards serve as an example. These are several duplicate punched cards attached together. If information is necessary regarding items sold, one of the cards is detached. Cards are accumulated and processed once or twice a day as required.

d. Manual forms - Information processed in present manner but gathered at a central point for transcription by key punch operators into machine language on card or tape.

e. Electronic point-of-sale equipment. This is the optimum solution to the input pickup problem. It also carries with it a large research and development cost. Inputs are placed directly into memory or remotely punched on card or tape for processing. This is accomplished with the use of a keyboard set placed at each point of sale (restaurant, front desk, valet, bar, etc.) and capable of transposing essential information into machine language as a by-product of completing an individual sales transaction or voucher. This reduces the chance for human error and eliminates the additional step normally required for central conversion of raw data to tape or card, prior to processing.[68]

3. Approach II and III will carry all information handling requirements (per the systems charts) including the accounting operation.

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[68]Haskins and Sells, op. cit., p. 23.

4. All equipment is on a lease price basis and does not include the communication line costs (required by large chains only); cost of special input devices; unusual installation costs; or paper supplies.

Approach I - Individual Hotel Use of Series 50 IBM Punchcard Equipment

The detail flow study indicates that in a hotel of 1,000 rooms, the equipment would have to handle approximately 15,000 cards per day;[69] one card would be produced daily for each room, for each voucher change, for each meal, each purveyor purchase item. Equipment handles room, food, payroll, and associated reports only.

Expenditures

Monthly Equipment Cost - $1,500 to $2,500 per month which includes a service contract. In order to handle food and beverage statistical analysis, an additional IBM 604 or 602A would be necessary at a rental price of $600/mo.

Payroll Costs - $1,500 per month (See Table II, p. 49)

Programming - $12,000 (See Figure V, p. 97)

Installation - $12,000

Dual Operation - $2,000 (5 people - 1 month)

Feasibility Study Cost - $4,000 (15 man days @ $300/day).

Advantages - Series 50 equipment is the least expensive in all respects and is the easiest to place into operation. With the calculator, this system could do almost all reports and statistical comparisons required in the front office, and food and

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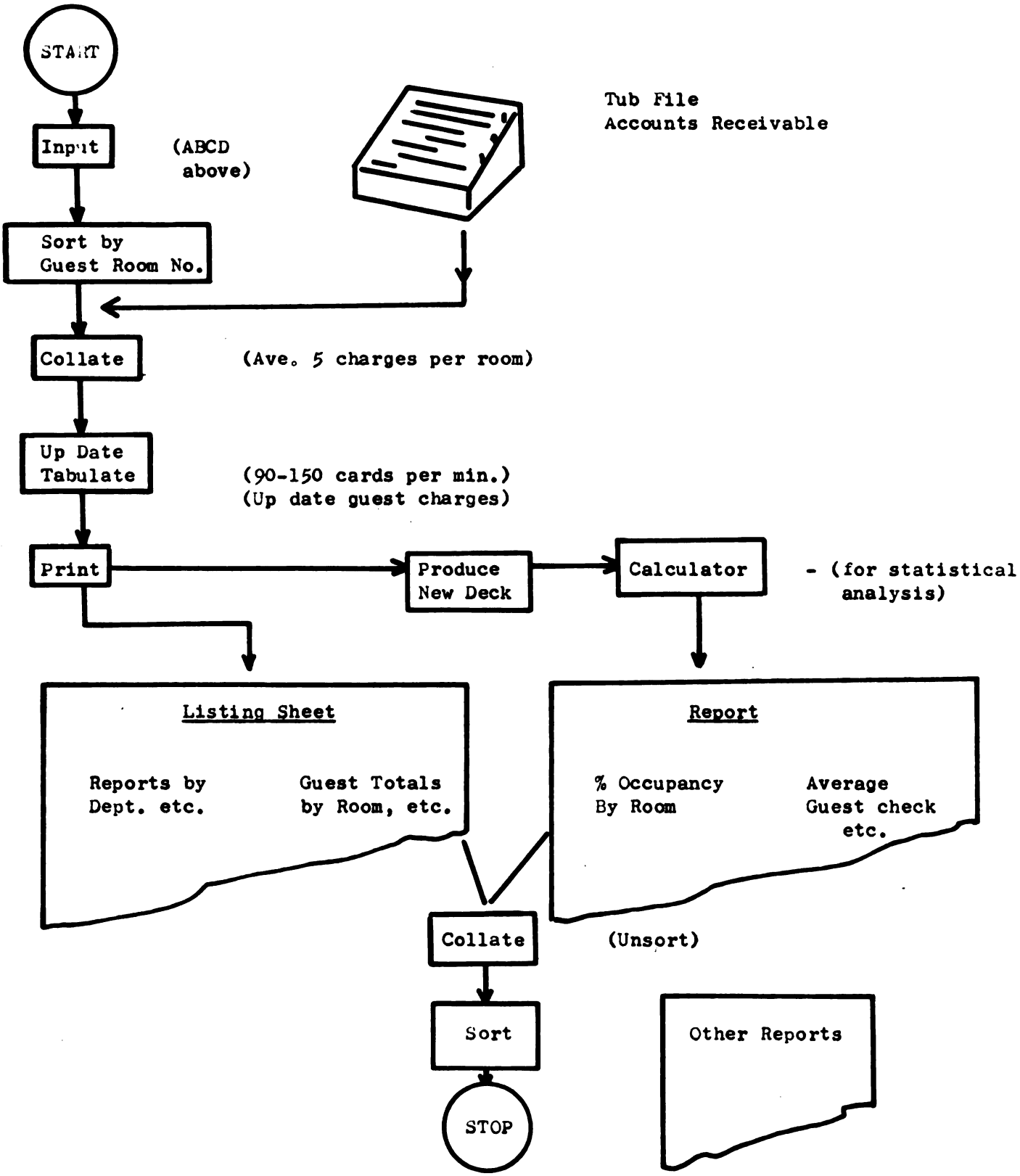
[69] Adams Associates

FIGURE V

SAMPLE RUN FOR POSTING DAILY ROOM CHARGES
BY PUNCHCARD SYSTEM



beverage operation. It will not produce a guest check instantaneously nor solve a complete information flow system. Increased volume can be quickly solved by adding more equipment. When the total complement of Series 50 equipment reaches a rental charge of $5,000 to $6,000 per month, consideration should be given to some type of computer system.

If Series 50 equipment is selected:

Total one-time monthly costs - (amortized over 5 years)	$ 500	
Total Monthly Recurring Costs -	4,000	(includes maintenance contract)
Total Monthly Costs	$4,500	

Approach II - Small Computer System for a Large Hotel

This system utilizes an electronic computer which has a random access feature. The equipment, located at an individual hotel, would handle daily internal and external information flow operations which would include rooms, food and beverage operations, statistics, payroll and general accounting functions. Three random access memory systems are presented on Table VII on page 93 for management's consideration.

Equipment costs for the RAMAC (305) run about $4,000 per month which is more than the RPC (9000) but less than the RCA 301. This consideration must be weighed against other features such as "variable word length" allowing for maximum packing of information in the memory as opposed to a "fixed word length" which does not. Storage capacity must also be considered.

The study group has indicated that the front office in a 1,000 room hotel should be prepared to handle 10,000 transactions per day. This

TABLE VII

COMPARISON OF THREE COMPUTER CAPABILITIES [70]

Equipment	Access Time	Memory Unit	Word Length	Cost	Character Storage	Advantages
1. Ramac (305)	250 milliseconds	Disc	Variable	$4000/mo.	5 million	Extra space can be used to store program. No need for plugboard.
2. RPC (9000)	1½ min.	Tape Loop	Fixed	$3500/mo.	1 mil. per loop	Expansion of equipment cheaper to add additional loops than new computer.
3. RCA (301)	7 microsec.	Disc	Variable	$5500/mo.	4.5 million	Very new

[70] Adams Associates, Computer Characteristics Chart. Charles W. Adams Associates, Inc., 1960.

means that RAMAC, taking 1/2 to 1 second to post 40 transactions [71] would require 250 minutes or four hours to post all the daily charges and provide the random access. The present 1,000 room hotel operation appears to require approximately a 1,000,000 [72] character storage. The RPC 9000 is cheaper in price but would not provide for the necessary initial capacity in the basic package, even though it has virtual unlimited memory capabilities with the purchase of additional tape storage units. If the tape drives were purchased, the minimum hotel requirements would bring the cost very close to RAMAC. The RCA 301 is still relatively unproven and appears to have strength where the hotel does not require it (i.e., fast access) at a higher price.

Expenditures

Payroll Costs - $5,000 per month

Programming for the unit selected - $54,000

Installation for the unit selected - Approximately $40,000

Peripheral input equipment already developed would run $175-200 for each keyboard plus the installation charge which may run very high if multi-stations (point-of-sale) are utilized. The problem involved is in the switching expense to produce the multiplex entry to the memory unit, requiring a high research and development installation cost.

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[71] Ibid.

[72] Ibid.

Dual Operation - $2,000 (5 employees for 1 month)

Feasibility Study - $9,000 (30 man days @ $300/day)

If the RAMAC is selected:

Total time to handle 10,000 daily transactions - 4 hours per day.

Total one-time monthly costs - (amortized over 5 year period)	$ 1,750	
Total recurring monthly costs -	9,000	
Total Monthly Cost	$10,750	(point-of-sale equipment not included)

Approach III. A Small Computer System for a Small Group of Local Hotels

(Zone Concept)

This approach would handle all internal information generated for a group of hotels (3 to 6, associated or not) by the utilization of the Minneapolis-Honeywell H 400 computer system. This computer does not have random access capabilities and leases for $10,000 per month.

The advantages and disadvantages of the zone concept are as follows:

1. There may be a greater payroll savings realized than in the two previous approaches due to the larger number of employees involved.
2. Guest ledger would be produced twice per day. Additional charges would have to be manually posted in event of guest check-out. This may be detrimental.
3. Costs are shared by several hotels, making it possible for smaller hotels to utilize the more powerful equipment.

4. Programming and conversion could require approximately two to three years to complete. [73]

5. Several problems arise as to conformity of operations where different hotels are involved.

6. High programming costs and a more complex switching or multiplexing problem would arise.

7. Duplication of equipment would be necessary in the event of breakdown.

8. Total time to handle room, food and beverage, reservations and accounting for one hotel - approximately 1½ hours. [74] This may not be sufficient utilization of the equipment for the cost involved.

Expenditures

Payroll Costs per month - $6,300 (includes 7 programmers and/or systems analysts)

Programming Costs - $120,000 (estimate)

Installation - $120,000 (estimate)

Line Charges - $10,000 (estimate)

Dual Operation - $24,000 (6 employees from 6 hotels for 2 months)

Feasibility study cost - $18,000 (60 man days @ $300 per day)

Total one-time monthly costs - (amortized over 5 years)	$ 4,867	
Total recurring monthly costs -	16,300	
Total Monthly Cost	$21,167	(To be shared by participating hotels, 3-6 maximum. Includes one computer system only. Two would be necessary.)

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[73] "Plugboard Thinking," The Armed Forces Comptroller Magazine, June 1959, p. 11.

[74] Estimate from Minneapolis Honeywell, September 1960.

Approach IV - Medium Computer System

Again, this solution as the previous one, would find its greatest economical advantage if used by a group of hotels, affiliated or not, since the total volumes of information available are the basic success ingredients. The group of participants may consist of a larger number of hotels limited only by the geographic distances which may make communication or line charges prohibitive or limited by the size of workload requiring a second and third shift operation. Information processing would be done by a medium size computer system and would immediately handle all statistical reports, reservations and possibly, at a later date, be expanded to include the centralized purchasing and payroll functions. It would not be required to handle daily activities at an individual hotel but would function more as a top level centralized management tool.

The Minneapolis-Honeywell H 800 is used as a choice of equipment. The system rents for $24,000 per month and does not have random access capabilities. By utilization of a tape memory, it has virtually unlimited capacity for retention of information, and is capable of handling eight programs simultaneously. Its smaller relative, (H 400) although less expensive, can process only one program at a time.

General advantages and disadvantages to this approach are as follows:

1. Line costs for transmission of inputs would be a large factor unless hotels are located in the same general vicinity, or unless each hotel accumulates information manually, mails it to a central point for conversion and manipulation. This last method appears to be the most economical.

2. No particular payroll savings will be realized since local personnel are not directly affected. However, definite intangible savings should be realized by management's ability to visualize trends more quickly, institute required changes promptly, and have in a relatively short period of time, critical information previously too expensive to accumulate.
3. The system will require the hotel employees to become cognizant of the fact that automation is in process, giving each one time to "live with the idea" of data processing. This may be useful in the event of future applications of EDP within the hotel.
4. It creates standardization of information mannually picked up for processing.
5. This concept is the most difficult to sell management since it lacks the payroll savings aspect.
6. It requires very little manipulation of figures by hotel, other than daily ones, since the weekly, monthly, bi-monthly, yearly forecasts, financial and statistical reports now done locally would be centrally processed.

Expenditures

Payroll Costs - $11,500 per month (includes 15 programmers or systems analysts)

Programming Costs - $100,000 (estimate)

Installation Costs - $100,000 (estimate)

Dual Operation and Conversion Costs - $10,000 (13 people for 2 mo.)

Feasibility Study Cost - $18,000 (60 man days @ $300 per day)

Total Monthly one-time costs - (amortized over five years)	$35,000	
Total monthly recurring costs -	35,500	(manual delivery of input information)
Total Monthly Costs	$70,500	(to be portioned among participating hotels)

The manufacturer has completed his part of the analysis with the presentation of one or several proposals similar to those above. Each figure would be supported by copies of computer-run charts showing basis for time estimates necessary to solve the hotel "operation specifications." There would also be an indication as to delivery date of equipment; necessary steps to train and indoctrinate the hotel personnel to perform EDP jobs; and detailed characteristics and specifications of the equipment. [75]

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[75] Neuschel, op. cit., p. 264.

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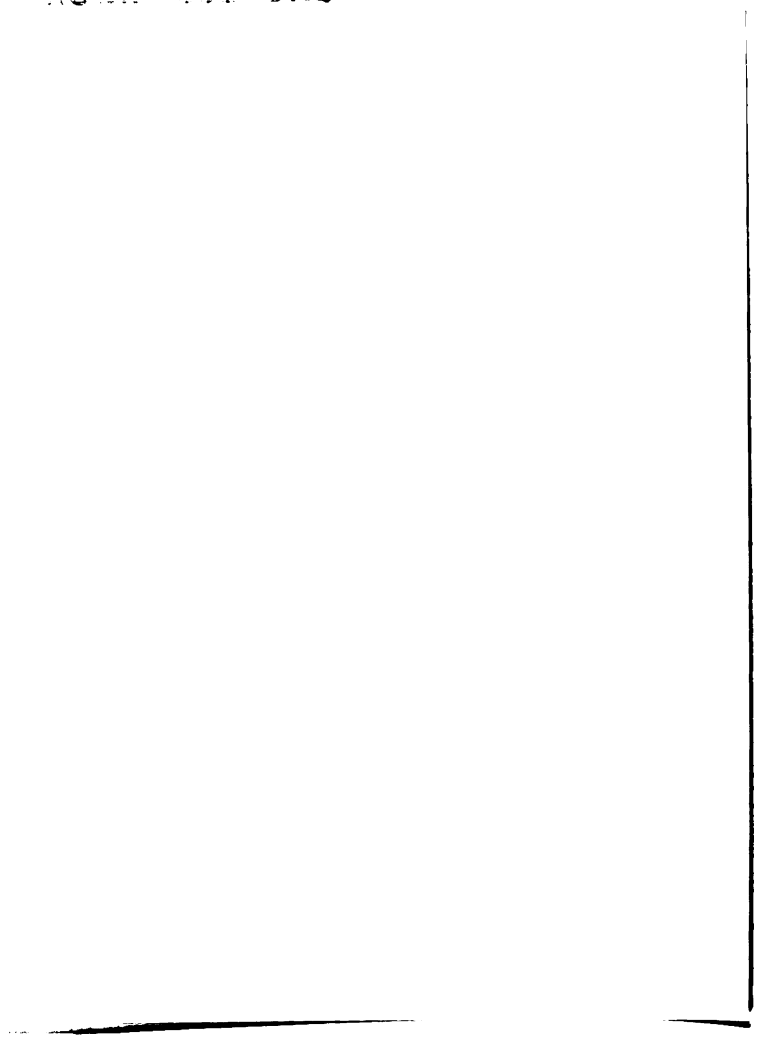

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