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An information system for the planning and control of a food service operation.

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AN INFORMATION SYSTEM FOR THE PLANNING AND
CONTROL OF A FOOD SERVICE OPERATION

A Dissertation Presented

By

ALBERT L. WRISLEY, JR.

Submitted to the Graduate School of the
University of Massachusetts in
partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

May 1971

Major Subject Business Administration

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1971

AN INFORMATION SYSTEM FOR THE PLANNING
AND CONTROL OF A FOOD SERVICE OPERATION

A Dissertation Presented

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C H A P T E R I

INTRODUCTION

The food service industry has a number of unique characteristics. Some of these have been responsible for only embryonic development of management systems in areas where considerable progress has been made in other industries. One of these areas is that of planning for, and controlling the use of, raw materials.

Purpose of Study

The purpose of this study is to outline the need for, and describe the development and testing of, an information system for the planning and control of food in a food service operation. Current systems that provide information in this area have a number of shortcomings. If a better system can be made available to food service operators a significant step will have been taken toward a more integrated and efficient total management system for food service enterprises. Systems development must of necessity involve the systems concept, the subject of the next section.

The Systems Concept

Hare points out that the scientific method of inquiry

is systems analysis in its broadest sense.¹ He also reminds us that, although the study of systems is not new, the approach, methods, tools used, and the results obtained differ from those of the past.² In The Theory and Management of Systems, the authors wrestle with the usefulness of the "systems concept" as an approach to managing organizations and conclude that the concept does have utility.³ Gagne has related systems development and psychology.⁴ Katz and Kahn used the systems approach in their study of organizational process.⁵ Use of the systems approach in space projects has made "systems" a household word, albeit one that is poorly understood.

Johnson, Kast, and Rosenzweig provide this definition of the systems concept:

The systems concept is primarily a way of thinking about the job of managing. It provides a framework for visualizing internal and external environmental factors as an integrated whole.⁶

This definition points up the integrative character of systems and the use of the systems concept to fit all of the necessary elements of a problem into a useful frame of reference. These same authors also point out that:

General systems theory provides for scientists at large a useful framework within which to carry out a specialized activity. It allows researchers to relate findings and compare concepts with similar findings in other disciplines.⁷

This paper describes the development and testing of a specific system--a planning and control system for raw

materials used in a food service establishment. The relationship of this particular problem with the systems concept is based upon the need for pulling together a number of bits and pieces into a useful system and, through the use of computer technology, operations research techniques, accounting techniques, and food management skills to develop a useful management tool for food service operators. Both the integrative and interdisciplinary aspects of the systems concept are much in evidence in this study.

A systems approach

The investigative approach used in this paper is similar to that suggested by a number of writers in the systems area.⁸ The format used is:

1. Statement of the problem.
2. Investigate environmental and system needs.
3. Construct a model which involves the following variables:
 - a) Inputs;
 - b) Outputs;
 - c) Process;
 - d) Logic;
 - e) Information.
4. Test the model.
5. Evaluate and extend the test results.

The paper stops short of field testing, the next logical step in the invention process.

Organization of the Paper

The remainder of this paper is organized into six chapters. In Chapter II an introduction is given to the history and nature of the food service industry.

Chapter III describes the needs of the food service industry, particularly in the planning for, and control of, raw materials. Needs both external and internal to the food production and service system are considered as bases for the proposed system.

In Chapter IV the current industry practices are analyzed. This section forms an important adjunct to the primary purpose of the paper because of the paucity of written material that integrates logically the interplay of menu, sales mix, forecasting, purchasing, and other factors on the raw materials cost of a food service firm.

The specifications for the design of the planning and control systems model are set forth in the first part of Chapter V. In the second part of this chapter the relationship of the various elements of the system are drawn up in the framework of a general systems design.

In Chapter VI the construction, and testing, by the use of simulation of the model are described and the output of the systems model is shown. The forecasting algorithm used in the model is tested under simulated

conditions.

An evaluation of the model and recommendations for extensions, further testing, and implementation are presented in Chapter VII, the concluding section of the paper.

FOOTNOTES

¹Van Court Hare, Jr., Systems Analysis: a Diagnostic Approach (New York: Harcourt, Brace, and World, 1967), p. 1.

²Ibid., pp. 1-7.

³R. A. Johnson, F. E. Kast, and J. E. Rosenzweig, The Theory and Management of Systems (2d ed.; New York: McGraw-Hill Book Company, 1967), pp. 3-20.

⁴See R. M. Gagne, ed., Psychological Principles in Systems Development (New York: Holt, Rinehart and Winston, 1966).

⁵Daniel Katz and Robert L. Kahn, The Social Psychology of Organizations (New York: John Wiley and Sons, Inc., 1966).

⁶Johnson, Kast, and Rosenzweig, p. 3.

⁷Ibid., p. 10.

⁸See especially: Arthur D. Hall, A Methodology for Systems Engineering (Princeton, N.J.: D. Van Nostrand Company, Inc., 1962), pp. 85-222.

C H A P T E R I I

THE CHANGING FOOD SERVICE INDUSTRY

The food service industry is currently undergoing changes unique in its history. For almost 200 years since 1765, the time of Boulanger, the world's first restaurateur, changes had been those of form rather than content. Improved physical plants, equipment, sanitation, methods of transport and supply, and personnel practices had changed the appearance of the industry; but, in truth, these improvements represented replacement or substitution rather than innovation. Chefs no longer cooked on spits turned by hand by small children or indentured apprentices but the raw materials they used were delivered in the same form, the heat from stainless steel ranges was little abated, and their kitchen helpers were only slightly better paid than their hapless predecessors. Dishrooms were still the cauldrons of hell so aptly described in George Orwell's classic Down and Out in Paris and London.¹ Cost control was entirely dependent upon the skill and personal concern of chefs and waiters, and profits were made in spite of the absence of controls rather than because any concerted effort was made to systematize the operation of a restaurant.

Most food service establishments were individually owned and managed. Unfortunately, this dispersion of ownership

guaranteed satisfaction for no one--guest or owner alike. Because of the lack of concentrated investment of capital, the restaurant industry had little means of bringing about and implementing those innovations necessary for the industry to match the progress being made in other areas of the business community.

As modern management methods and improved technology rapidly accelerated the productivity of manufacturing concerns, with the consequent improved working conditions and higher wages, the service industries found that not only were their skilled personnel being attracted out of the field but that they were forced to offer relatively higher and higher wages in order to attract even marginal workers. Too, new forms of food service organizations and new methods of managing them, were appearing. Suddenly the traditional laissez faire methods of operation no longer produced a profit for restaurateurs. With this development, the restaurant industry began to move into the modern age.

Impact of the Chains

Probably the strongest push toward modern restaurant management occurred as a result of the formation of the restaurant chains. Multiple operations forced ownership to devise methods of operation and control that were not dependent on the presence of the owner for the maintenance of some kind of control. Even so, the earliest chains relied

heavily on family members to insure that the prerogatives of ownership were not usurped by the employees.

The 1920's saw the formation of a number of food service chain operations. Very few of these managed to survive the 1930's and for all practical purposes the real development of these operations can be traced from the end of World War II.² And it is from this time that some real, if not universal, changes began to become incorporated in the operation of food service firms.

The most evident need in multiple operations was that of establishing a consistent product in order that customers could count on such factors as quality, quantity, and price, factors so necessary for establishing a good company image in the eyes of the public. This meant standardizing recipes, portions, and method of preparation. It also meant establishing consistent sources of supply and cost controls. In effect, it meant that methods of operation had to be articulated in easily understood form and that the mystique surrounding the heretofore all-powerful reign of the chef had to be dispelled.

Certain of the changes nullified this mystique so well that the position of chef was eliminated in many cases. The Stouffer Restaurant Corporation, for example, developed a system of standardized, tested recipes and standard portion sizes, and then trained relatively unskilled women to produce and serve them. Nowhere in the table of organization

of this 100 million dollar chain can the position of chef be found.

Changes in Kitchen Organization

Other changes were taking place in the organization of the restaurant kitchen. Concomittant with the diminishing importance of the chef as the central figure, the traditional French-English kitchen with its highly organized departments, centering around product lines and with its rigid hierarchy, was giving way to a more fluid arrangement in which workers might more easily work at a number of different tasks.³

One determining factor in the trend away from specialization in restaurant kitchens was the increase in union activity in the food service industry. In order to be able to use personnel on different jobs it became necessary to steer away from descriptive titles that would tend to describe a specific function for the worker. Thus "Kitchen Helper, Grade I" became a more useful title for management than "1st Commis to the Saucier."

One disadvantage of the passing of the highly structured French-English kitchen was that the newer setup was, and still is, often under-organized. The result, according to Dukas and Lundberg, was "too few departments, no regular line of promotion, no understudies, too few supervisors, ill-defined jobs and little prestige for the various jobs."⁴ The National Restaurant Association today is highly concerned

with the lack of a visible "occupational ladder" for food service workers.⁵ A good dishwasher (a few such individuals actually do exist) may find himself wedded to his position indefinitely--a victim of his own aptitude and dependability.

The Use of Management Systems

A result of change from highly skilled specialists to semi-skilled generalists has been to increase the need for well-trained supervisory personnel and the replacement of individual skills with systems designed to enable restaurants to produce and serve acceptable meals. Certain of these systems have been developed and used skillfully by some restaurant operators. The previously mentioned examples of the Stouffer Corporation is a case in point. These systems have been heavily slanted toward the actual production and service of food--along with the incorporation of good personnel management practices. In systems terminology, considerable attention has been given by these firms to the processor.

Other developments have brought about remarkable changes in raw material inputs. Improvements in transport and delivery enable food service firms to utilize fresh products the entire year rather than seasonally as before. But the greatest difference in raw materials has been in methods of pre-preparation and packaging. Freezing, vacuum packaging, freeze drying, and other means of preservation of foods have

made large differences in storage, delivery, and spoilage losses. Pre-prepared or convenience foods have made it possible for the restaurant operator to substitute materials cost for labor costs. Surprisingly, few operators have turned this possibility to their advantage.

One of the most obvious uses of management systems has been in the area of food franchising, an area that deserves extended discussion.

The Impact of Food Franchising

The role of the restaurant franchise should not be ignored as a prime mover in the need for, and development of, new management systems for the food service industry. Currently the franchise restaurant represents the fastest growing segment of the industry.

The year 1919 saw the sale of the first restaurant franchise when the A & W Root Beer Company sold a franchise in Lodi, California.⁶ Today A & W is the world's largest franchisor in number of units with over 2400 of these stands in 1969. Bill Marriott, who bought an A & W franchise in 1926, is today Chairman of the Board of the Marriott Corporation, a hospitality company that, among many endeavors, franchises Big Boy hamburger units and Marriott Motels. With 25,000 employees and 1969 sales of 430 millions of dollars the Marriott Corporation is one of the giants of the industry.⁷

The concept of permitting the small businessman to combine his personal incentive with the managerial know-how of big business has been largely responsible for the success of the franchise. To quote Lundberg: "It is a way of business that has permitted hundreds of small businessmen to enter the hotel and restaurant business with a pre-packaged product, a format, an image, a system of operation, a market plan and a scheme of finance."⁸

In order to service its franchises successfully, the franchising company must put together a successful package that includes financing or financing advice, a marketing plan, locating development and selection, a tested product line, and, most importantly, a system of operation that can be adopted easily by the franchisee. Because the relationship between franchisor and franchisee is not as close as that between the home office and a unit of a wholly owned chain, this system of operation must, of necessity, be capable of being maintained with less direct supervision than is normally possible in the non-franchise operation. This requirement lent added impetus to the development of better systems of operation.

Effect on the market

In order to place the impact of multiple-unit food service companies (both franchised and company-owned) in perspective it is necessary to investigate their place in

the food service market.

In 1969 the away-from-home feeding industry realized an estimated 25 billion dollars in sales. Institutions Magazine listed the 400 largest chains (which included both company-owned and franchised units) as contributing 15.7 billion dollars of these sales. Subtracting such non-public feeders as the armed services and the National School Lunch program, Lundberg estimates that public restaurant chains are responsible for some 40 percent of the total.⁹ Perhaps even more important is the size of the average chain/franchise unit.

The MacDonald Hamburger chain feels that one of its units is in serious financial difficulty if its annual sales should fall below the \$200,000 mark.¹⁰ The Stouffer Corporation operations at 666 Fifth Avenue in New York City enjoy annual sales of well over 6 million dollars.¹¹ Most successful franchise operations fall somewhere in between these two figures.¹²

Large unit sizes made it possible to introduce management methods that would not otherwise have been feasible. The so-called "Ma and Pa" operations could neither afford, nor in most cases need, many of the systems or procedures used by the large units.

In summary, then, the impact of restaurant chains--whether company managed or franchised--has been that of both creating a need for better management systems and

providing the resources to fill that need.

Economics and the Food Service Industry

The 40's, 50's, and 60's saw other changes in the American scene besides the development of large restaurant units. These changes were to have a considerable impact on the food service industry. Primary among these was the effect of certain economic changes brought about by our post-World War II economy.

As a rule of thumb a restaurant operation that can maintain direct operating costs of less than 70 percent of gross sales can expect to approximate a 5 percent profit before income taxes.¹³ In the 1920's the salaries and wages account in the average restaurant ran about 15 percent of gross sales.¹⁴ By 1967, a study by the national accounting firm of Horwath & Horwath found that payroll costs, including employee benefits, had risen to 35.1 percent. The same study found that food costs, including employee meals, were 39 percent.¹⁵ Obviously, the totals of these averages would exceed the target figure of 70 percent.

Another interesting statistic is that wage rates in the food service industry increased 29 percent in the period 1964-1969 against a 19 percent rise for manufacturing and a 23 percent rise for the retail industries.¹⁶

Employee productivity during the years 1958-1968 rose at a 3.5 percent rate in industry while in the food business

productivity remained at a standstill.¹⁷

As a result of these factors, restaurant operators were presented with two alternatives--raise prices or increase efficiency, if they wished to maintain profit ratios. Some, of course, did both--and some did not stay in business. Unfortunately, both the raising of prices and increasing efficiency have built-in limiting factors--factors intimately connected with the competitive aspects of the industry.

Who is the competition?

The restaurant operator is concerned about his competitor down the street. The operator will keep a watchful eye on his own price structure and the type of menu he presents to his customers. If the prices of a competitor go up he may feel quite comfortable about raising his. Up to this point we could be talking about Ford and General Motors or General Electric and Westinghouse. But the comparison grows weaker when another more serious form of competition is considered.

It can be said that, in the long run, the food service operator's chief competitor is the housewife and, indirectly, the retail food industry. Restaurants are in business to add value to food. This value takes the form of convenience, service, atmosphere, and, perhaps, excitement and change. A large portion of the away-from-home feeding volume does not represent an absolutely necessary service; there are

alternatives. If the restaurateur prices himself above a certain range, these alternatives will be used more readily than comparable alternatives in other industries because they are more readily available.

Other problems

Many food service operators suffer inefficiencies in their operations that stem directly from the use of outmoded plants and equipment. Too, lack of meaningful research into industry problems has been a negative factor in the progress of the industry. In the matter of research, the restaurant operator, particularly the smaller owner, is in much the same position as the small farmer --with a major difference: the farmer has the huge resources of the Department of Agriculture to promote research and then extend the results. As a matter of fact, it would appear from a review of available literature that most of the recent research affecting the food service industry has been done by companies outside the industry --particularly suppliers of food, equipment, and supplies.

The Need for Change

The need for changes in food service management practices, then, is a result of pressures on many fronts. Large, multiple, absentee-owner chains required standard operating systems. All operations were caught between

increasing cost pressures and their inability to pass on inefficiencies by raising prices. And change was forthcoming.

It has been previously mentioned that change was forthcoming in the development of standard systems of operation. Other changes were evident in the creation of new types of operations. Among these the fast-food type of operation is particularly notable. The American Machine and Foundry Company developed an almost completely automated drive-in. These systems, aimed primarily at cutting the direct operating costs of labor and raw materials, have been quite successful. A report by the National Restaurant Association traces costs and profits from the period 1956-1965 for all restaurant corporations showing an annual net profit. This report indicates that this profit as a percentage of gross sales has risen from 2.6 percent in 1956 to 3.3 percent in 1965.¹⁸ This turn-about does not necessarily indicate that the problem has been solved. It does, however, indicate a movement in the right direction.

It is the thesis of this paper that restaurant operating systems are currently lacking with respect to the amount and kind of planning and control information necessary to develop and maintain the efficiency of the physical processes critical

to the operation and to keep these processes supplied with the proper inputs. In the following section we will examine these particular needs more explicitly.

FOOTNOTES

¹George Orwell, Down and Out in Paris and London (New York: Harper and Bros., 1933).

²For a complete discussion of the development of chains in this period see: Donald E. Lundberg, The Hotel and Restaurant Business (Chicago: Medalist Publications, 1970), pp. 158-162.

³Peter Dukas and Donald E. Lundberg, How to Operate a Restaurant (New York: Ahrens Publishing Co., 1960), p. 143.

⁴Ibid.

⁵Interview with Dr. George Hall, Educational Director of the National Restaurant Association, October, 1969.

⁶Information relayed by Dr. Donald E. Lundberg as the result of an interview with Edward Webber, president of A & W Root Beer Corp., April, 1971.

⁷Lundberg, p. 276.

⁸Ibid., p. 217.

⁹Ibid., p. 158.

¹⁰Ibid., p. 225.

¹¹The Stouffer Restaurant Corporation.

¹²Lundberg, p. 218.

¹³Ibid., p. 186.

¹⁴Ibid., p. 159.

¹⁵As reported by Lundberg, p. 178.

¹⁶Bureau of Labor Statistics, "Eating and Drinking Places Industry," Industry Manpower Surveys, No. 115 (March, 1969).

¹⁷Ibid.

¹⁸"The Washington Report" (Chicago: National Restaurant Association, April, 1969), p. 3.

C H A P T E R I I I

THE NEEDS OF THE FOOD SERVICE INDUSTRY

There are a number of reasons why food service operations are deficient in terms of planning and control systems. Among these are:

1. The nature of the business.
2. The nature of the managers.
3. The lack of research in the area.

The Nature of the Business

Much goes on in a food service operation--and it takes place in a very short time. These two factors present food service operators with very special problems in the collection of information and its use for planning and control. A typical food service operation performs all of the functions usually associated with any business enterprise. These include planning, purchasing, receiving, issuing, preparation, production, distribution (marketing)--all the way through the post-transaction activity. The difference between a restaurant and a manufacturing company, however, is that all of these functions may take place in a matter of hours in the restaurant. Add to the speed with which these functions take place the fact that our typical restaurant operation is engaging in many small transactions during this short time

span and some of the difficulties in data collection and use become apparent.

Another difficulty is that most restaurants are handling many product lines; and these products, for the most part, are compounds of various raw materials. The result: there are problems in the control of inventory and the compilation of information necessary to purchase efficiently.

The Nature of the Managers

Restaurant operators, as a group, are people-oriented.¹ They have chosen their vocation based on this orientation. Many do not enjoy the functions of their business that are not directly related to either their employees or their customers. Planning and control, particularly control of raw materials, do not fall within their primary orientation.² Consequently, most small food operators do not utilize those information and control methods currently at hand. The small size and the involvement of management in all phases of the operation often create a situation in which cost control, and the information necessary for cost control, are neglected simply because the manager is forced to handle those aspects of his operation most imminent to the performance vis-à-vis his customers. Too, he may not recognize the importance of control to the success of his business.

In larger operations departmentalization creates a more

favorable situation for management regarding the specific control of various aspects of an operation. Unfortunately, the tools available to provide the necessary information to the large operator are inadequate for the task at hand.

The Lack of Research

We have already commented on the lack of research being carried out relative to the food service industry. That there is need for this research was borne out by a unique industry study.

An industry survey for the future

In 1968 the American Hotel and Motel Association commissioned the School of Hotel Administration at Cornell University to direct a study of hotel/motel operations in the United States. This study was carried out by Booz, Allen & Hamilton, Inc., under the hotel school's guidance, with the stated purpose "to determine how to best prepare the lodging industry to meet the requirements of the public 10 years from now in relation to trends and developments which will influence their desires and requirements."³

The report was named "Operation Breakthrough" and, among many recommendations, made the following regarding food planning and control:

- 1) "Develop a Food Planning and Control System to Minimize Food Loss and Optimize Food and Beverage

Inventory Levels Within Hotels/Motels.

The food and beverage control system will forecast individual item demand requirements by meal period for at least the seven subsequent days. These forecasted requirements will be used to plan each day's production quantity for items that are not prepared to order. The menu item forecasts will be broken down to establish a forecast of the kinds and quantities of food ingredients required by day for the next week for each perishable or high dollar food item. These forecasts of food requirements will establish the proper purchase quantities by food item. This approach provides a uniform method of planning the quantity of food to be sold and of ordering food in accordance with the plan."⁴

2) "Use the Forecasting Subsystem to Prepare a Sales Forecast for Each Menu Item.

A menu file is maintained by the computer system with at least the following information stored in it.

- Menu item number and description.
- Price per serving
- Quantity per serving and unit of measure, such as 8 oz. of roast beef
- Other items included with the meal, such as bread, salad
- Average number of servings demanded per meal period

Each day the system will update the average demand for each

item based on the sales data taken from restaurant checks. Forecasts of future demand for each item are developed by adjusting the current moving average by the forecasted house count for each day in the forecasting period."⁵

3) "Use the Food Planning System to Establish the Quantity of Food to be Prepared Each Day."⁶

This section recommends that production planning and requisitioning be tied in with forecasting.

4) "Utilize Inventory Management Techniques in the Inventory Control System to Establish Economic Order Quantities, Reorder Levels, and Food Control Reports."⁷

This subsystem would minimize inventory costs, establish and maintain an ordering policy, and prepare food control reports. Figure 1 is a schematic of the food planning and control system of the future as envisioned by this report.

The report's recommendation for providing these systems revolves around the use of the computer. The logic in this is inescapable as the use of computers currently appears to be the only feasible answer to the necessity of handling the large amount of data generated in short periods of time so characteristic of the industry.

In this regard "Operation Breakthrough" points out that the industry will benefit most directly from more effective use of current improvements affecting computer costs and

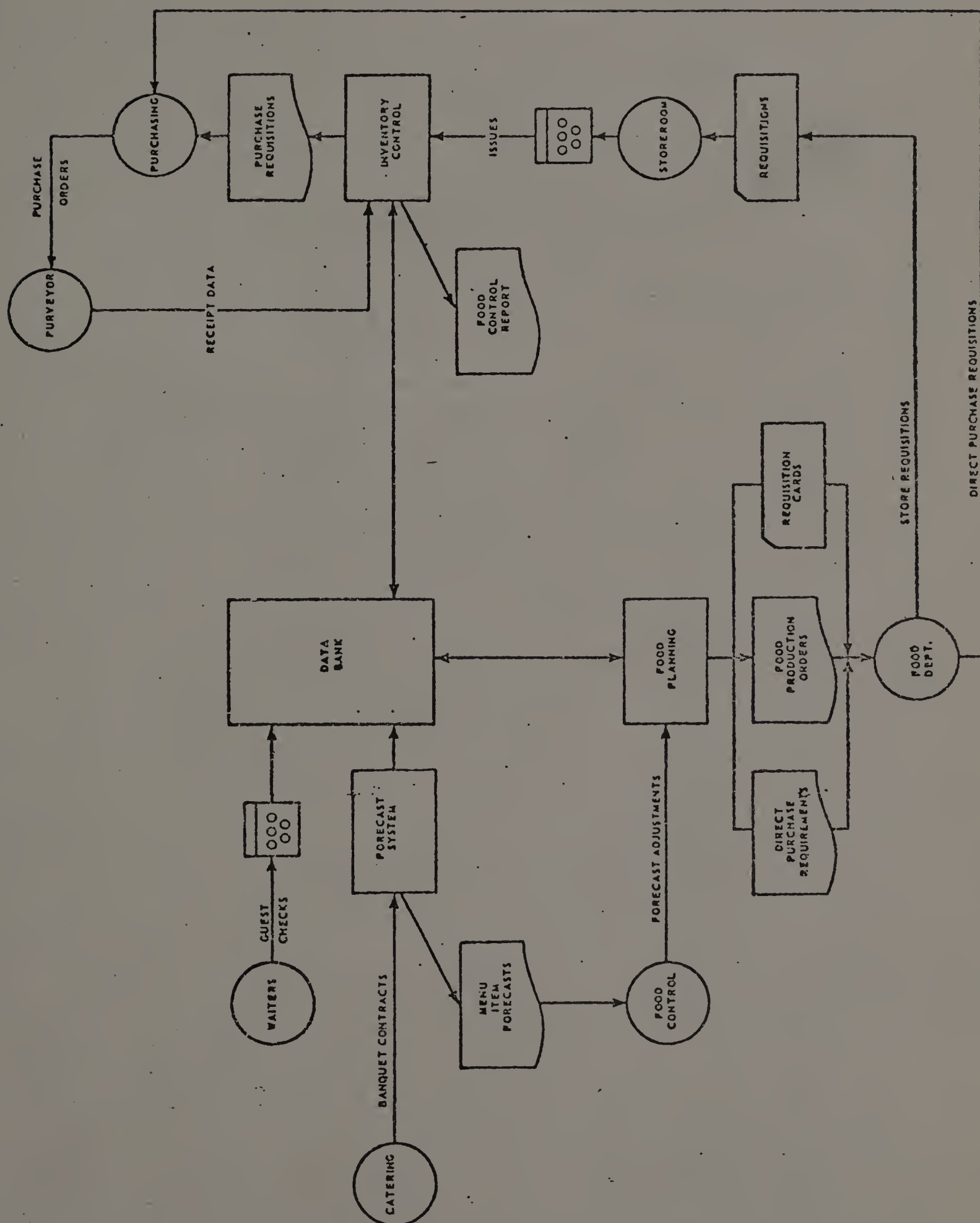


Figure 1.--A food planning and control system of the future, taken from "Operation Breakthrough," p. 159.

speeds and from current technology which has not been used by the industry in any significant way.⁸

The report also points out that a reduction of computer costs and the utilization of on-line real-time systems will bring the possibility of computer use to the large number of relatively small operations in the industry.⁹ That this is a significant fact can be seen readily if the structure of the industry is considered.

The Structure of the Industry

Table 1 indicates the number of public eating establishments and institutions with food service by kind and size of business in the United States in 1966. Of the 343,749 total public eating establishments, only 47,825 or just under 14 percent enjoyed gross food sales of more than \$100,000. A system which would be economically feasible for establishments with gross sales of over \$50,000 would mean that those potentially able to benefit from such a system would be increased by 54,273 establishments.

At this point we should investigate some of the specific information needs of the food service operator relative to the planning and control of the raw materials, i.e., food used in his operation.

Food Cost Information Needs

Most food cost information surfaces at some point in

TABLE 1.--United States Public Eating Establishments and Institutions with Food Service--
Number by Kind and Size of Business, 1966

Kind of Business	-----Gross Food Sales-----					Total
	Less than \$20,000	\$20,000- \$49,999	\$50,000- \$99,999	\$100,000- \$299,999	\$300,000 and Over	
Separate Eating Places	57696	69632	39455	29411	5540	201734
Separate Drinking Places	33329	14445	2785	914	174	51646
Drug or Proprietary Stores	6006	4535	1226	245	0	12013
Retail Stores	9690	8188	3149	1502	291	22820
Hotels, Motels, or Tourist Courts	5415	4386	2640	2596	1522	16558
Recreation or Amusement Places	9365	5682	2591	1727	45	19411
Civic, Social, or Fraternal Associa- tions	2510	871	461	461	51	4355
Factories, Plants, or Mills	2346	1989	918	1224	306	6784
Other Public Eating Places	4374	1731	1048	957	319	8429
Total Public Eating Establishments	130731	111460	54273	39037	8248	343749
Hospitals	598	1241	1104	2069	920	5931
Sanatoria, Convalescent or Rest Homes	1854	2096	685	363	121	5118
Homes for Children, or the Aged, Handicapped, or Mentally Ill	1421	1421	732	345	172	4092

TABLE 1.--Continued

Kind of Business	-----Gross Food Sales-----					Total
	Less than \$20,000	\$20,000- \$49,999	\$50,000- \$99,999	\$100,000- \$299,999	\$300,000 and Over	
Colleges, Univer- sities, Profes- sional or Normal Schools	230	115	519	922	980	2766
Other Institutions	6969	1876	447	268	179	9738
Total Institutions	11072	6750	3486	3966	2371	27645
Grand Total	141803	118210	57759	43003	10619	371394

Source: U.S. Department of Agriculture, Economic Research Service, The Food Service Industry: Structure and Characteristics, 1966, Statistical Bulletin No. 416 (Washington: U.S. Government Printing Office, 1968), p. 27.

time as a ratio of the cost of raw materials to sales. These ratios are compared to budgetary ratios or, as is usually the case, with the historical ratio the operation has experienced. If the operator considers the ratio to be too "high" he then takes steps to locate the source of the variation. If he can locate the cause at one of several different sources he supposedly applies corrective measures. This system has only limited effectiveness for several reasons.

In the first place, the operator's budgeted or historical ratio serves only as an upper bound. He knows he is in trouble from a profit standpoint if he exceeds his standard. He does not know, however, what the standard should be, given the menu pattern he is presenting to his customers. In other words, he has no standard cost information that can be used as a base for calculating meaningful variances. Price changes, changes in materials cost, and the mix of items purchased may be affecting his ratio potential without his knowledge because he lacks this information.

Secondly, the food service operator usually does not know where inefficiencies may be taking place or, as pointed out above, whether factors other than inefficiencies are causing cost changes. Some operators break their ratios into food groupings; but these breakdowns suffer the same failings as does the overall ratio.

Lastly, food cost information is seldom available in time to deal with current problems. If the food service operator receives his food cost figures from his accountant by the middle of the following accounting period he may be from forty-two to forty-five days late in attempting to exert control on a deviant situation which may be shifting daily--or even hourly. Unfortunately, many operators either receive cost information even later than this, or do not receive it at all.

The accounting firm of Harris, Kerr, Forster takes the position that a form of standard costing should be used. In the book Profitable Food and Beverage Operation, written by three members of the firm, a standard costing scheme is proposed under the title of "Pre-Cost, Pre-Control System."¹⁰ Although the concept is sound they do not indicate how the system can be implemented and maintained by the small or medium-size operation. It would, indeed, be difficult for any operation, regardless of size because of the amount of data that must be handled.

The problem, of course, is that the development of a complete standard cost system given the number of different raw materials and the number of transactions involved in even a small restaurant presents a formidable challenge to hand data processing. The obvious use of computers for this purpose has been hampered by the lack of research and the small size of most operations.

Forecasting Needs

The success of meal forecasting has primarily been dependent upon the skill and experience of the operator. Sales histories (where maintained) are used to prepare forecasts.

Forecasting is essentially a two-step procedure. First, the total number of meals (or covers) is predicted and then the breakdown or mix of the individual menu items. Most forecasting difficulties arise in the second step as the popularity of an individual dish will vary depending on the other items presented with it (cross elasticity of demand), weather, time of year, day of the week, and some element of random selection. Too, the reputation of a particular establishment in regard to their "specialties" is another influencing factor.

The total number of covers will also depend on a number of variables including time of the year, time of the month, day of the week, weather, special events, national and local economic trends, pay days, and any number of "local" variables.

A literature search and the author's twenty-five years of observation have revealed no formula approach to forecasting on the part of commercial food service operators. On the other hand, some operators do a quite adequate job of forecasting through experience and utilization of their

knowledge of the variables listed above.

The importance of an adequate forecast for planning in the areas of purchasing, staffing, and production scheduling are obvious. Not so obvious is the necessity on the part of commercial food operators to forecast the potential contribution of a given menu to their operational profit. For the amount of contribution a given menu will provide depends not only on the difference between cost and selling price of the individual items but also on the number of items sold.

Purchasing Needs

The variety of food purchasing practices in the industry is almost as great as the number of establishments. Some establishments do much of their purchasing from a local grocer, practically on a daily basis. Many large chains engage in central purchasing and maintain warehouses and/or central commissaries. Other operators buy from wholesalers distributors, jobbers, farmers, and through purchasing cooperatives.

Regardless of the size of the operation, purchasing is normally a two-step process. Staples purchasing is inventory-based, utilizing some concept of mini-max or par stock ordering. Perishable goods purchasing is based on forecasts and ordering is done close to the point of use.

Forecasts are translated into recipe amounts from which ingredients are calculated or estimated and the amount of food usage established. Obviously, the translation of forecasts to purchase amounts is a time consuming process when hand calculation is the only available technique.

The preciseness of the purchasing technique described above is seldom followed. Inventory amounts are usually not known at any given time, no formal inventory parameters are established, and the translation of forecasts to amounts to be purchased are merely rough estimates. Again, the operator relies primarily on experience and instinct to carry him through. Storage and holding costs are not known and enter into his purchasing decisions only peripherally. This is also true of ordering costs. Only in a few large chains are these costs given any consideration. Some smaller operators may not need this information but at least one report indicates that 80 percent of surveyed establishments without inventory controls feel that it would be desirable that such controls be installed.¹¹

Production Needs

Ideally, a food service operation maintains standards that allow it to present to the guest a dish that represents exactly the quality the management wishes established for its product. These standards involve standard specifications for ingredients, standard recipes, standard portion sizes,

and standard presentation or merchandising. The ideal is observed more in the breach than the performance. Using standards involves first their determination and, secondly, seeing that they are maintained.

The slow passing of the first class chef from the food service scene has provided the impetus for the establishment of these standards in many operations where they once existed only in his head. In order for less-skilled workers to produce acceptable dishes the procedure had to be committed to paper.

With the increasing use of convenience or "ready" foods the responsibility for the setting and maintenance of standards is shifting more and more into the hands of the purchasing staff, for quality standards are hidden in the brand names of convenience items. Much of the maintenance of quality and standard portion size is in the hands of the outside food producer.

An important aspect of the functions of cost control, forecasting, purchasing, and production is that, although they are extremely interdependent, many operations treat them as independent functions.

Summary

In this section we have looked at some of the needs of the food service industry in relation to the information

needed to implement planning and control. In a fast-moving restaurant operation the short period of time between planning and sale and the large number of small transactions and products involved create a real challenge to conventional information systems. That this information is needed in the areas of food cost, forecasting, purchasing and production is well established. The problem then is how to provide necessary data in such a way that the needs of management are met. In the next section we will look more closely at current practices in order to establish the base for a proposal for filling this information need.

FOOTNOTES

¹Lundberg, p. 7.

²Conclusions reported to the author by Dr. Donald E. Lundberg. Dr. Lundberg reached these conclusions as a result of the administration and interpretation of "several hundred" Kuder Preference Records, administered to students and alumni of the Cornell University School of Hotel and Restaurant Administration in the period 1946-1949.

³Booz.Allen & Hamilton (under the direction of the Cornell School of Hotel and Restaurant Administration), Operation Breakthrough: an Approach to Hotel/Motel Operations in 1978 (New York: The American Hotel and Motel Association, 1969), Foreword.

⁴Ibid., p. 159.

⁵Ibid., pp. 159-160.

⁶Ibid., p. 160.

⁷Ibid., p. 161.

⁸Ibid., p. 51.

⁹Ibid., pp. 51-52.

¹⁰Joseph Brodner, Howard M. Carlson and Henry T. Maschal, Profitable Food and Beverage Operation (4th rev. ed.; New York: Ahrens Publishing Co., Inc., 1962), pp. 376-395.

¹¹"The State of Information Processing in the Hotel-Motel Industry: a Survey Report" (New York: Harris, Kerr Chevernak and Co., October, 1970), p. 15.

C H A P T E R I V

CURRENT INDUSTRY PRACTICES

Although this section will be devoted to the investigation of current practices in food service operation, with particular attention to information, planning, and control as applied to the food used in the operation, it will be necessary to set certain limitations on the investigation.

As can be seen by returning to Table 1, there are more than 371,000 eating and drinking places in the United States. These range from establishments doing less than \$20,000 per year in gross sales to those doing more than \$6,000,000 per annum. It is obvious that methods of operation must, and do, vary depending on size, type of management, type of operation, location, and several other factors. For this reason, the practices described will be those most generally found in the better managed establishments. It should be kept in mind that, unfortunately, a large number of operators have no systematic approach or operating policy. These operators run their establishments much as an extension of the home kitchen or on the basis of some unfathomable personal vision of a successful restaurant operation.

The Menu

It would be difficult to overrate the importance of the menu to the success of a food service operation. It is the single most important determinant in the areas of purchasing, staffing, equipping, marketing, and production. It is a controlling factor in establishing the atmosphere or ambience of the establishment and will establish the profit potential of the establishment. Strangely, the menu is only an afterthought in many operations.¹

Definition

There is some confusion as to just what is meant by the word "menu." The term is derived from the French word minute and originally meant a small list. Bill of Fare is a closely related term. What is meant here is the communications device by which the restaurant operator informs his customers exactly what his product line is for a particular day. It is part of his marketing effort.

The other use of the word "menu" is in the more generic sense of the product line itself. It is this concept of the term that we refer to as being the dominant factor in the food service establishment. It is in the confusion of the two concepts that some operators find themselves concentrating on the marketing device and ignoring the greater import of the product line idea.

For example, it is common practice for some chefs to

walk into their refrigerators early in the morning and, on inspecting their contents, to base the day's menu on what they may happen to have on hand. A popular book on food and beverage operation states that "the contents of the refrigerators should be the first consideration of the menu writer because they are fundamentally a place of temporary storage, not a low temperature storeroom."² Later we find that "a good menu from the patrons' standpoint, and an economical menu from the restaurant's standpoint, is not possible unless the refrigerator is checked before menu-making is undertaken."³ These statements simply will not stand up under a careful consideration of the needs of the food service operator in the areas of planning, purchasing, and the development of an optimum product mix--a mix that will satisfy both the customer demand and the desired profitability of the establishment. Other considerations must come before the refrigerator.

The menu and the investment decision

Theoretically, anyone wishing to build a restaurant should develop his menu before attempting to consider his financing, budgeting, or before shoveling the first spadefull of dirt for the foundation. The reasoning follows.

Before entering into the restaurant business (or any other) the entrepreneur attempts to forecast his probable return on his investment. He is, after all, supposedly

going to make a logical decision regarding the value of his investment in the restaurant in relation to lost opportunities to invest his capital in other ventures. We will assume, for example, that he will not choose to suffer the agonies and risks of running his own establishment for a lesser return on his capital, after taxes, than he would on a tax-free municipal bond.

In order to calculate his probable return he must cast a pro forma income statement. The usual method of forecasting income and expenses is to: 1) calculate the profit needed to provide the desired after-tax return; 2) using average industry statistics, calculate the sales volume necessary to provide this return; 3) determine whether this sales figure is feasible--considering the size and the planned average sale of the proposed operation; 4) subtract forecast profit, fixed costs, and semi-variable costs from sales; 5) determine whether the remainder, which represents the amount available for variable costs--primarily raw materials--is realistic in light of industry statistics for establishments of the class being considered.⁴ There are several problems inherent in this approach.

To begin with, it is obvious that the size of the proposed restaurant is a critical variable. This variable in turn is dependent on the amount of available investment capital and the class of the proposed operation. With a few exceptions, class and size are opposing variables and

must compete for available capital; that is, we must expect that a higher class establishment with a concomitant higher check average will mean less seating (and vice-versa) if we are dealing with a given amount of capital.⁵

The problem then becomes one of balancing the size of the establishment and the average check in such a way that the multiple of the average check value and the potential customers will produce the desired sales volume. But in order to determine what the average check figure will be the sales mix must be known.

By sales mix we are referring to the menu items being presented to the customer and the number of each item we expect to sell. If this is known, along with the sales price of each item, we can then calculate a potential average check. In other words, it would be impossible to make a logical forecast regarding potential sales volume without first knowing what the makeup of the menu will be. Unfortunately, the budgeting procedure described three paragraphs back would still lead an operator astray. For if he were to utilize the sales volume as a starting point and proceeded to subtract out all costs other than raw materials, he would quite likely end up with a perfectly useless figure for his budgeted cost of food. In fact, once a menu was developed and priced in order to determine potential sales volume it would be found that potential

food cost and potential profit had also been determined.

To clarify this situation it is necessary to look at the method by which menu prices are established.

Menu pricing

In general, there are two recommended methods for pricing items on a menu--the food cost method and the prime cost method. The first involves marking up a given item using the budgeted food cost percentage and the cost of the raw food used in the item.

Food cost method.--For example, a restaurant offers a one-pound order of chicken with nothing accompanying it (a la carte pricing). If the chicken costs the establishment \$.30 and if the target ratio from the operating budget of the cost of food to sales was \$.40, the menu price of the chicken would then be $$.30 / .40$ or \$.75. Actually, the price would probably be set at some higher figure, say \$.80 in order to allow for certain inefficiencies in the operation. It would, after all, be unrealistic to expect 100 percent efficiency in the utilization of raw materials.

If a price is being set on a combination of items the cost of the items surrounding the entree must be determined and added in. This becomes a fairly complicated procedure in the case where the customer has a choice from several different appetizers, vegetables, desserts, and the like. It then becomes necessary to determine some weighted average

cost of each of these categories. This requires that sales data be available or, in the case of a proposed operation, that forecast data be available for all items.

Prime cost method.--The second method is the prime cost method in which the labor cost (direct) of the items is added to the raw material cost. The selling price is then based on the budget ratio for both food and labor in the same manner as the method described above. Proponents of this method argue that it is unfair and unreasonable to ignore the fact that an item such as beef stew may incur three to four times as much direct labor per serving as a T-Bone steak.⁶

Disadvantages of current methods.--Although on the face of things both of these methods appear to provide a logical means of pricing menu items it turns out that neither can be used for little more than approximate bench marks.

The operator using either of these methods will soon find himself face to face with the factors of tradition and competition. Traditionally, customers expect to pay certain prices for certain items. Each jump in price from five, to ten, to fifteen cents for a cup of coffee in fast food establishments has been accompanied by the heartfelt yowls of the regulars. One establishment, for example, raised the price of coffee by discontinuing refills. Where coffee plus refills had cost the customer \$.10, he now found himself paying \$.10 for each cup. Within three days the daily

breakfast covers had dropped from 400 to 200, where they remained until the new pricing policy was rescinded.

The customer is also aware of the relationship of the prices of certain items even when absolute price is not a factor. If the price of stew appears to be too high relative to the price of steak we can expect to see a decrease in the number of sales of stew.

If two or more restaurants are in direct competition the operator who prices certain items above his competitors will find that he is at a disadvantage--even if other items he sells are priced under the competition prices. He will discover that those items do not perform as they should in his sales mix.

The use of these pricing methods will often create price mixes that are unacceptable to the customer and make a reasonable pattern of prices impossible. As an example, the current price of chicken is about \$.30 per pound. If it is assumed that the cost of surrounding items is \$.50 per cover the total food cost for a chicken plate would be \$.80. If the desired food cost ratio was $$.33\text{-}1/3$ the price of the dinner would have to be \$2.40 (ignoring the inefficiency factor). The present cost of a 12-ounce U.S.D.A. Choice Sirloin Strip steak is approximately \$2.00. If we add in \$.50 for the cost of surrounding items and apply the ratio of $$.33\text{-}1/3$, the cost of the steak dinner would have to be \$7.50. It is quite probable that the

restaurant operator would, in fact, use neither price. If the class of his restaurant and the willingness of his customers to pay dictated that he could successfully charge \$7.50 for the steak he would also be able to charge considerably more than \$2.50 for the chicken. Or, in another class of establishment, management might find that they would have to lower the price of the steak considerably in order to sell the item. At the same time they might find that they were able to do quite nicely with the chicken at a \$3.00 selling price.

The prime costing method has one further disadvantage and that involves the difficulty in obtaining item labor costs.

Restaurant kitchens have no set standards of productivity; nor, in most cases, does a cook work solely with one item at any given time. The separation and allocation of specific direct labor costs under these conditions is nearly impossible. There are no machines or production lines to establish work speeds and these speeds vary from employee to employee. For these reasons the prime cost method exists more as a concept than a practical reality.

Some advantages of food cost method.--The pricing method based on food cost has some value to the restaurant operator. He can use it as a guide for pricing unusual combinations of items, as a basis for pricing single-entree

meals (such as banquets), and as a method of putting him somewhere in the ballpark when he has no other indicators he can use.

One other traditional block to the food cost method of pricing is worth mentioning here. That is the practice of most public restaurants of maintaining menu prices for relatively long periods of time. This means that changing food costs are not immediately reflected in changed menu prices. Whereas a grocer changes his prices as his costs change, the restaurateur does not. The result is that when a price change does come it may reflect not only changes in costs that have taken place over a fairly long period but the anticipated changes over some period in the future. This in turn means that current price is only one factor in the decision.

In actual practice most prices are set by a sort of "cut-and-fit" method. The restaurateur sets a price with an eye on competition, a knowledge of traditional pricing, and finally on what he feels his customers will pay without an effect being felt on his total volume. This means that each food item will probably have a different markup and the actual ratio of the cost of food to sales will depend on the weighted average of the items sold. Only by forecasting sales and costs can the potential of the menu be determined.

The concept of variable margin

As a matter of fact, the good restaurant operator is not overly concerned with his food cost percentage. What he really is interested in is the amount each item will contribute to all other costs and the profit of the operation. He is interested in selling items that will give him the largest possible margin between his variable costs and gross sales. The larger he can make this margin with a given number of customers the greater his profit. In accounting terms this amount is known as a variable margin and has particular significance in the restaurant industry.

The concept of variable margin is significant because of the nature of the other costs incurred in the operation of a food service establishment. In most restaurant operations only the cost of raw materials is truly variable; i.e., proportionate to sales. Even this cost is proportionate to sales over a fairly narrow range of volume. An exception to this are certain supply costs, such as napkins and other paper supplies. And as this category of supplies is often thrown into the same expense account as other supply costs that are not variable, it is possible to consider raw materials as the only variable cost. Over any reasonably short period of time all other costs show only slight variability.

If a period of time as short as one day is considered

only the raw materials cost is of concern to the operator as a controllable cost. Labor costs cannot be reduced by any significant amount. Costs of heat, light, and power are nearly constant regardless of volume. The only savings, other than raw materials cost, will be on certain supply and linen costs--relatively small items.

It is possible to visualize a typical restaurant at 5:00 P.M. on any given day. The building is warm, the employees are present, advertisements have been run, the long cleaning job preparatory to opening has been completed, and the evening's customers have begun pushing through the doors. The profitability of the day's business now rests on the number of customers that will be served, the mix of items that these customers purchase, and the efficiency with which the raw materials go into the patron's meals. Only these three variables are subject to control, once the operator is committed to serving the meal. By speedy service he can attempt to serve the greatest possible number of customers; by clever merchandising he can try to sell those items with the largest variable margin; and by efficient control of raw materials he can attempt to avert waste and inefficiency.

An example will show how his sales mix will affect his variable margin and, ultimately, his profitability.

Consider a hypothetical food service operator who sells only two items as follows:

	Fried Half Chicken	Sirloin Strip Steak
Selling Price	\$3.00	\$5.00
Variable Cost	\$1.00	\$2.50
Variable Cost %	33-1/3%	50%

This is a situation that is often misinterpreted by food service operators. Part of the reason is a built-in predilection toward food cost percentages on the part of the operator. If an operator, basing his action on the lower food cost percentage for chicken, should push the sale of chicken, he would minimize his profit with every sale. Actually, his profit would increase in the same direction as food cost with the largest amount of profit (or least amount of loss) occurring at a 50 percent cost with all steak sales and the minimum at a 33-1/3 percent cost with all chicken sales. To clarify, let us look at these two items again.

	Fried Half Chicken	Sirloin Strip Steak
Selling Price	\$3.00	\$5.00
Variable Cost	<u>1.00</u>	<u>2.50</u>
Variable Contribution to Fixed Cost and Profit	\$2.00	\$2.50

Now, if 200 guests walk into this establishment the maximum total variable margin (or contribution) would be \$500.00 (200 x \$2.50) if all steaks were sold, and \$400.00

($200 \times \$2.00$) if all chicken were sold. We can also see that if our fictitious operator can increase the proportion of steak to the chicken he sells by dropping the price of steak to any amount above \$4.50, he can increase his total contribution.

If food service operators could price all items at the same ratio of cost to selling price it would, of course, still be to his favor to sell the higher priced items to increase his contributions.

Another way to see the effect on profits achieved by selling higher contribution items is through the use of a break-even chart, such as the one in Figure 2.

Given an operation with a sales mix and customer count that produces the cost/volume relationship indicated by V. The profit for this operation is the difference between total costs (T.C.) and sales ($C=S$) or the distance from C to S. If the sales mix should change in such a way that higher variable contribution items became a larger share of the individual sales, with customer count remaining the same, the cost volume relationship indicated by V_1 would apply and, even though total costs would have risen from T.C. to $T.C._1$, the distance from C_1 to S_1 would be greater than that from C to S--indicating that profits had risen. Of course, if all items bore the same cost/sales ratio the slope of the total cost line would

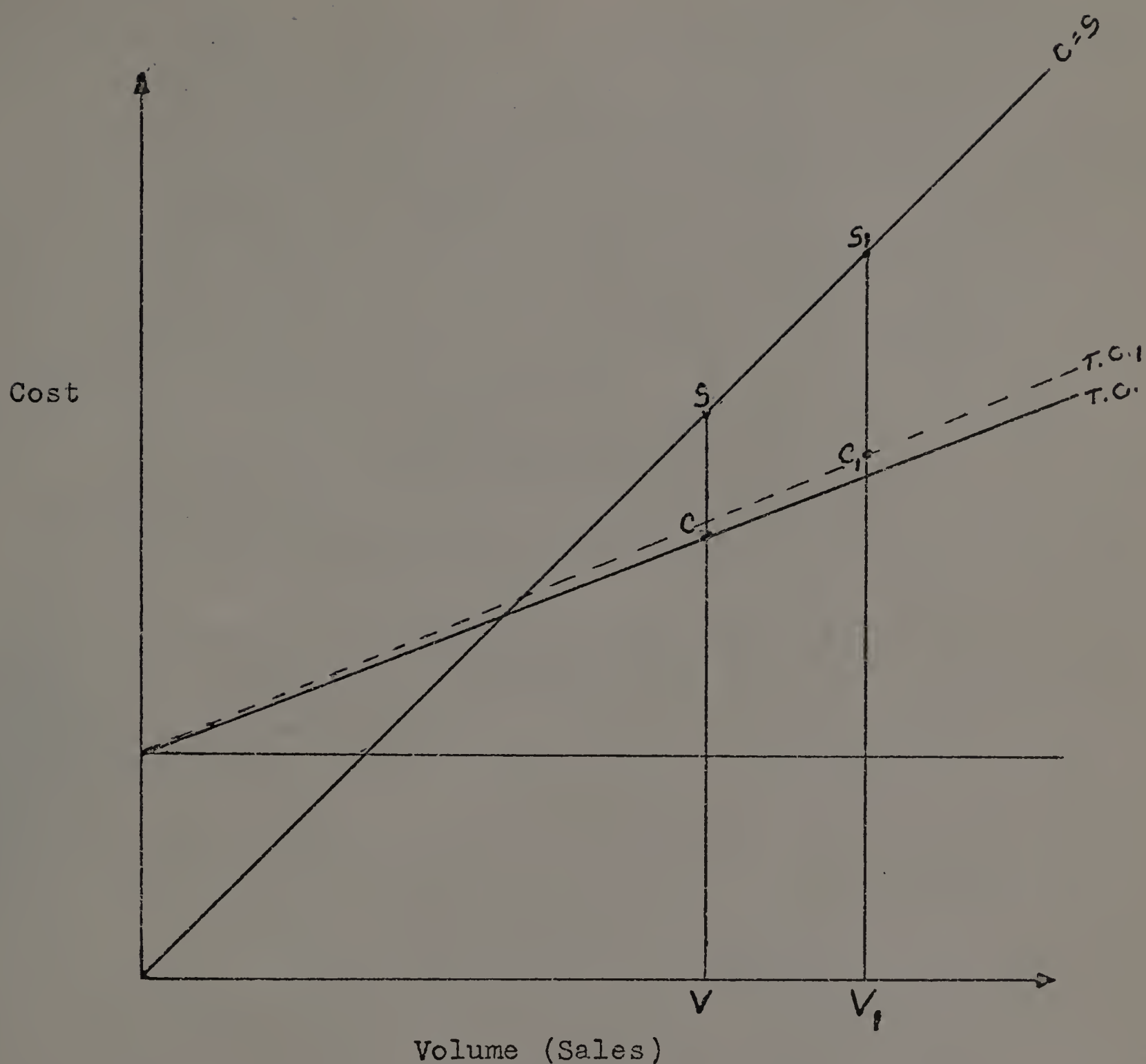


Fig. 2.--Breakeven chart showing cost/volume relationship in a hypothetical food service operation.

not change and profits would be even higher. As it was pointed out in the previous section, however, this would rarely be the case.

Difficulties in use of variable margin

It becomes apparent that the cost/sales price relationship of each menu item and the total variable contribution

of each menu or a total menu pattern is critical to the success of an operation in relation to profits. Unfortunately, this information is seldom known to the operator. There are a number of reasons for this lack of information.

In order to be able to predict the contribution of any given menu or menu pattern several conditions must be met. The menu makeup must be known in advance, a reliable forecast of expected volume must be available, a good purchasing system (which includes reliable sources of supply) must exist, and item costs and selling prices must be known. Let us look at each of these necessary conditions.

Although the ability to create menus or menu patterns well in advance of use is well within the grasp of food service operators, a surprising number of them make up their menus only one step in advance of the arrival of their customers. These operators do not use their menu as a guide to purchasing but rely on what has been purchased to indicate what will appear on the bill of fare. Their argument is that by holding off on their menu-making they can take advantage of current changes in market prices. The criticism of this argument lies in the fact that:

- 1) the poor sales mix that may result from this lack of planning may be much more costly than paying higher costs;
- 2) all departments of the establishment will suffer from lack of planning; and 3) it is possible to make substitutions in planned menus to enable the operator to take advantage

of significant market-price changes.

Those restaurants that present a non-changing menu have eliminated their planning problems as far as their menu is concerned. There are a limited number of restaurants whose location or type of menu allow them this luxury. Prominent among these are the fast-food operations. Single-menu establishments are also found at the other end of the class spectrum where large offerings and high prices tend to eliminate some of the necessity for change.

It is the middle-priced food service operation, enjoying the patronage of a steady clientele, that requires change and variety to maintain demand. It is in these operations that considerable time and effort should be expended to create profitable menus far enough in advance of use so that they can be used as an effective tool for planning. Before investigating how this is done, let us look at the other conditions necessary to predict the contribution of any given menu or menu pattern.

A good forecast of expected volume is primarily dependent on the skill of the forecaster. This means that he must be conversant with a number of variables that will affect his forecast and must be able to correlate them to obtain meaningful estimates. As indicated in Chapter I, these variables include such information as day of the week,

month, season, weather, special events, economic conditions, department store sales, and the like. Some of the data used are historical; other data involve assumptive information.

In general, the forecast is made far enough in advance of the date of the menu to allow sufficient lead-time for purchasing. Historical sales data are utilized to indicate total customer count under similar conditions. This is tempered by any information the forecaster may have concerning the date in question to arrive at an estimate of total customer count. This count is then broken down into an item-by-item forecast with the forecaster drawing upon his experience and the track record of the items being offered. This presents some difficulty if records are not available on the exact mix of items on the menu in question.

The reason for this is that the sale of any given item is dependent to a large extent on the array of dishes that are "up against" it on the menu. The demand for roast beef, for example, may be quite different when steak is also on the menu than when it is not. Here, again, the establishment that offers only a single menu has the advantage of a constant mix. Even so, there may be a different sales mix for different days of the week. Roast prime ribs may be an excellent sales item on Saturday night but a rather poor one on Monday. A good sales history

record will help to pinpoint these daily changes.

Even a forecaster with considerable experience may show consistent forecast error. The personality of the forecaster may dictate whether he will tend to over or underestimate as a usual practice. Some operators maintain a comparison of forecast versus actual sales to spot consistent types of forecasting errors.

A method of forecasting that would enable accurate forecasts to be made regardless of the experience factor of individual forecasters is a needed addition to the management tools available to the restaurateur. An experienced manager in a new location, or an inexperienced forecaster, may result in poor forecasting for a considerable length of time. Such a method would be an integral part of a total planning and control system. As indicated in the previous chapter, such a method is not currently available.

A good purchasing system is the third condition that must be met in order to predict the contribution of a given menu. The operator must have the capability of successfully obtaining the ingredients necessary to prepare the menu offerings, and must see that these items will be available at the desired time. It has been said that good food purchasing is "having the proper foods, at the proper place, at the proper time, and at a price that you

wish to pay." Purchasing practices will be discussed in detail in a later section but at this point it is sufficient to point out that the above statement embraces the goals of a purchasing subsystem--another important element of a total planning and control system.

The last condition, that item costs and selling prices must be known, is easily achievable in concept but considerably more difficult to meet in practice.

A menu item may have anywhere from one to twenty or more ingredients. Even a very simple menu may have at least twenty-five menu items and some menus may have items numbering into the hundreds. Purchase prices on these items are constantly changing. In addition, the transformation a food item may go through from its condition as purchased to its condition as used in a recipe may require that additional computations be made to translate recipe amounts back into as-purchased quantities. Conversely, it may be necessary to translate as-purchased costs into edible portion costs. For example, a straight division calculation may involve determining the cost of one cup of flour taken from a hundred-pound bag. This calculation can be made more complex if the recipe calls for a cup of sifted flour. Now we must know the yield of a hundred-pound bag in these terms in order to calculate the cost properly. Other examples are yields from the butchering of meats and yields from the preparations of raw

vegetables. Taken together, these considerations pose an almost insurmountable obstacle for the operator interested in achieving the proper mix of costs and selling prices in a situation where he is making up a fresh menu for each day's operation. Unless he enjoys the luxury of a large staff, he is simply unable to make the necessary calculations. The use of computers to simplify this task is an obvious answer to the problem and a few members of the industry are beginning to move in this direction. The use of computers will be investigated in greater detail in a later section.

A result of the computational problems is that few food service operators enjoy knowing the profit potential of their menus unless the same menu or set of menus has been used for a considerable period of time and the results have been observed. This information is ex post and planning for the period already gone by has been forfeited.

Planning the menu

How does the restaurant operator decide what specific items should appear on his menu? This question has numerous answers; the most of these will be investigated at this point.

It has already been indicated that a large number of operators construct their menus around the raw materials on hand. Whether the products are actually in the

establishment or are on order in advance of menu-planning is immaterial. The purchasing function is determining the product line rather than the other way around.

A second method is an improvement of the first. The operator develops his menu plan in advance of purchasing. This gives him the obvious advantage of being able to fit his menu to the various considerations it must meet. The problem lies in the number of variables the menu-planner must consider.

It has been indicated that a well-planned menu must have the potential of returning an acceptable variable contribution to all other costs and to profit. This means that all menu-item costs must be known along with selling prices and forecasts. The difficulty in determining item costs and developing reliable forecasts has been previously discussed. Unfortunately, the menu-planner has a number of other variables he must consider.

He must first consider the staff available to produce and serve the various items on the menu. Is the skill available to create a desired item? Will the proposed items create a work overload for the staff? Will the number of sauces and the amount of carving required slow service? All of these questions must be answered.

The menu maker must also consider the equipment available. Too many fried items on the menu may overload the capacity of the deep fat fryers. He must also determine

whether there is sufficient oven capacity, cooking ware, and china available to accommodate his menu plan.

Marketing considerations are a primary concern of the menu-planner. Will the menu fit the needs of his desired clientele? Cost/price considerations become meaningless if the operator cannot create a demand for his product. In order to sell high-contribution items he may have to offer items with a relatively low contribution to bring people into his establishment.

Other marketing considerations revolve around internal consistencies which must be present in the menu structure. The menu offerings must cover a wide-enough range of product types to meet customer expectations. This may be only one item in certain operations, but this fact is well advertised. A specialty house may emphasize a particular type of products such as steaks or seafood. Other operations need to offer a range of choices from meats, fish, and poultry to non-meat dishes. The planner must be aware of flavor combinations; he must offer complimentary flavor choices. He must be careful not to repeat flavors in different courses. The menu maker must be aware of color combinations, food shapes, and consistencies. An execrable example of neglect of these principles is a plate of creamed chicken with mashed potatoes and corn. Garnishes must be considered to increase the attractiveness of the principal item.

In addition, as mentioned earlier, the good menu-planner must worry about the necessity of creating a marketing device, the menu card, to present to the customer. Here he must be concerned with layout, readability, attractiveness of wording, color, placement of items to create a merchandising impact, and the use of special devices to call the reader's attention to those high-contribution items he wishes to push.

It is a safe conclusion that, from all points of view, few, if any, perfect menus are created. Large chains with large staffs come closest to the ideal. The individual operator has little chance of satisfying all of the constraints that must be met in the planning of a menu. If he can settle on one menu or on one menu pattern he may, in time, be able to adjust his offerings to meet most of these considerations. If he creates a new menu for each day he must simply trust to luck.

There are methods, used by too few operators, by which the problem created by the complexities of menu-making can be attacked. One of these, the use of a cyclical menu pattern, is an old concept; the other, computer assisted menu planning involving the use of linear programming, is quite new.

The cyclical menu

A cyclical menu pattern is one that repeats itself at

given intervals. Technically, a restaurant that has but a single, unchanging menu has a cyclical menu pattern.

Cyclical menus may also mean that the customer can expect to find the same items on the menu each Monday and so on through the week. Unfortunately, these two concepts of a menu cycle have done much to discredit the approach in the industry on the basis that cyclical menus result in menu monotony. This does not have to be the case.

An effective way to use cycle menus is to stagger a given menu so that it does not appear in a pattern recognizable to the customer. For example, a restaurant that used similar menus on week-days and a special menu on Sundays might set up a number of different daily menus--providing that number is not divisible by six. This causes the daily menus to appear on different days in consecutive appearances. Obviously, the larger the number of different menus the more difficult it would be to detect the cycle. On the other hand, too large a number defeats the purpose of the cycle menu, that of appearing to offer a larger selection of items than really is the case. Three or four Sunday menus are then used to create diversity for that day. A typical menu cycle might be the one illustrated in Figure 3.

The cycle in Figure 3 is constructed for a restaurant that serves one type of menu Monday through Thursday and on Saturday and somewhat different menus on Fridays and

The Complete Menu Cycle for 13 Weeks or 18 Weeks

<u>Wks.</u>	<u>Sun.</u>	<u>Mon.</u>	<u>Tues.</u>	<u>Wed.</u>	<u>Thurs.</u>	<u>Fri.</u>	<u>Sat.</u>
1st	S-1	D-1	D-2	D-3	D-4	F-1	D-5
2nd	S-2	D-6	D-7	D-8	D-9	F-2	D-10
3rd	S-3	D-11	D-12	D-13	D-14	F-3	D-15
4th	S-4	D-16	D-17	D-18	D-1	F-4	D-2
5th	S-1	D-3	D-4	D-5	D-6	F-1	D-7
6th	S-2	D-8	D-9	D-10	D-11	F-2	D-12
7th	S-3	D-13	D-14	D-15	D-16	F-3	D-17
8th	S-4	D-18	D-1	D-2	D-3	F-4	D-4
9th	S-1	D-5	D-6	D-7	D-8	F-1	D-9
10th	S-2	D-10	D-11	D-12	D-13	F-2	D-14
11th	S-3	D-15	D-16	D-17	D-18	F-3	D-1
12th	S-4	D-2	D-3	D-4	D-5	F-4	D-6
13th	S-1	D-7	D-8	D-9	D-10	F-1	D-11

14th	S-2	D-12	D-13	D-14	D-15	F-2	D-16
15th	S-3	D-17	D-18	D-1	D-2	F-3	D-3
16th	S-4	D-4	D-5	D-6	D-7	F-4	D-8
17th	S-1	D-9	D-10	D-11	D-12	F-1	D-13
18th	S-2	D-14	D-15	D-16	D-17	F-2	D-18

Fig. 3.--Typical cyclical menu pattern, 13 or 18 weeks.

Source: Albert L. Wrisley, Jr., "The Cyclical Menu," Food Management Program Leaflet Number 6 (University of Massachusetts Cooperative Extension Service, 1965), p. 8.

Sundays. This particular cycle includes 18 daily menus, 4 Friday menus, and 4 Sunday menus. As can be seen, daily menu number one (D-1) makes its first appearance on a Monday and does not appear again until three weeks later on a Thursday. It would not appear on a Monday again for 18 weeks. Friday and Sunday menus are run through for four weeks and are then repeated.

Although this type of a staggering scheme is effective in relieving monotony in offerings, it is not always necessary. Resort hotels and hospitals, for example, may be able to take advantage of average lengths-of-stay and simply repeat menus at given intervals. This gives them the aided advantage of designing each menu for a particular day--an important consideration in resorts which may have relatively poor sources of supply and also may wish to tie in certain items with days of arrival, party nights, and other special functions.

An important point concerning cycle menus is that when properly used they tend to prevent the monotony that affects many menu patterns. This monotony is a result of the menu maker falling into a rut due to a number of different factors. Among these may be habit, the fact that certain foods are delivered on certain days, and that the absence of certain employees on certain days--the head chef may be off on Wednesdays--resulting in the menu being

tailored to the skills of a second man. A restaurant operator may not even recognize that a pattern has been formed until faced with his handiwork over time.

There are a number of advantages to the use of a cyclical menu pattern. Among these are:

- | | |
|-----------------|---|
| 1. Forecasting. | 4. Service. |
| 2. Purchasing. | 5. Training. |
| 3. Production. | 6. Time saved in the menu-making process. |

Remembering that forecasting is essentially a two-step process: 1) estimating the total number of expected covers and, 2) breaking this total down into the number of each individual item expected, it can be seen that the use of a cycle menu solves a major problem involved in the second step. The forecaster can take advantage of the fact that, when the menu appears in the cycle, an historical record is available with the exact mix of offerings. He can then use this established relationship to forecast the item breakdown more accurately.

Improved forecasting means improved purchasing. The operator has better knowledge of quantities needed. Additionally, by knowing well in advance what his product mix is, he is able to meet lead-time requirements easily.

The management of a food service establishment that has set up standard recipes to guide the production of the menu is anxious that these menus be followed exactly in

order to maintain quality. Even a well-trained cook may experience difficulty with a new or strange recipe and will do a better job upon repetition within reasonable periods of time. This is particularly true in a new operation and would work very much to the advantage of a seasonal operator--such as a resort feeder--who has but a short time to break in a crew that may be inexperienced to start with. Like production personnel, service people gain in efficiency with repeated appearances of certain menu items.

Those dishes that require niceties of service or special handling will be presented with greater delicacy or flair than if the service person were relatively unfamiliar with them. This is especially true in the arrangement of food on the plate, where plate service is used, to present the most attractive appearance possible. Use of a cyclical menu also results in service personnel who are more familiar with proper garnishes to accompany certain dishes and the proper use of china or glassware to set off the food.

It can be seen that training personnel to handle food with consistency can be made easier by the use of a cyclical menu. A great many different items may be served in an establishment over the course of a year under a cyclical menu plan, but the new employee will have time to become adept at handling an item before a new cycle is

put into use. This is particularly appropriate in seasonal businesses or in situations where training time must be compressed.

It takes a considerable time to develop and write a good cycle menu. Once the job is finished, however, the operator will need to spend only the time necessary for refinements and changes. This represents a considerable saving in effort devoted to menu making over time.

In general, the use of a cyclical menu pattern is a matter of putting the menu operation on a businesslike basis; it is setting up that part of the food service operation according to a plan. It also eliminates the haphazard, operation-by-crisis chaos that is all too often present.

Two disadvantages often cited in relation to cycle menus are the lack of flexibility and the need to make use of left-overs. Properly used, this type of menu does not have these disadvantages.

Once a cycle menu is completed it should not be ignored as "finished" and considered inflexible. One practice is to keep a list of substitute items in various cost/price ranges to use in the event of emergency or a changing situation.

The leftover problem can be attacked in the following ways:

- the leftover item can be sold as a flyer or rider item;
- preparation methods can be refined so that smaller batches are made at any one time, thus lessening the chance of large amounts of leftovers;
- improved forecasting through use of the cycle menu will result in better production estimates;
- full utilization of some items can be realized by freezing for use the next time around the cycle.

Seasonality of certain foods are handled in cyclical patterns by altering the pattern to fit the seasons. A northern operation, for example, might have four distinctive thirteen-week cycles yet have the actual menu content differ relatively little--using seasonal offerings to create the illusion of considerably more difference than actually exists.

Computer assisted menu planning

The use of computers to assist in menu planning is a comparatively recent development. Although there has been no application of computers to the planning of menus for commercial restaurants it is worth noting the progress that has been made in other areas.

Menu planning by computer has been localized in the institutional segment of the food service industry, primarily in hospital menu planning.

The impetus for planning menus in hospitals by computer grew originally out of the well-known diet problem. This problem was attacked first by Stigler with refinements

in terms of palatability published later by Smith.⁷ These studies were concerned with finding the minimum cost combinations of foods satisfying certain nutritional constraints.

An operational extension of these early studies was developed by Balintfy at Tulane University. Balintfy's work is by far the most comprehensive and useful application of the use of computers to menu planning and forms the base of most other applications by other investigators.⁸

Balintfy defined menu planning as "the problem of finding the optimum combination of menu items which satisfy predetermined levels of nutrition, palatability, and economy for a sequence of days."⁹ He considered the menu item, not food, as the basic unit of planning.

Using integer programming techniques he developed a multistage menu planning model that would plan least cost meals, further subject to nutritional and popularity constraints, for a series of days. In addition, a food usage program provides a listing of the food ingredients needed to produce the menus planned.

The importance of this development can be understood if the complexity of preparing dietary menus is considered. Not only must certain minimum requirements for common nutrients be met but a variety of diets such as low sodium and low fat--the so-called "modified" diets--must be planned. The multistage model makes it possible to plan

menus that each day meet necessary requirements.

Balintfy also developed a single-stage model that plans dietary menus over a cycle or period of several days, meeting total constraints for the period. This model has the advantage of using a linear programming, rather than integer programming technique.¹⁰

Although Balintfy's work represents a real contribution to those institutional feeders, such as hospitals with limited menus and relatively little choice, the actual planning concept does not fit the usual restaurant situation.

In the first place, as Balintfy indicates, "Maximizing profit implies the existence of selling prices which depend on the other hand on the demand and this leads to very complicated nonlinear models. All the applications thus far justify the acceptability and advantages of the minimum cost 'best buy' models."¹¹ Minimum cost, of course, does not necessarily mean maximum profits.

Secondly, although Balintfy, along with separate studies by Gue and Ligget, has indicated the possibility of adding the element of selectivity to dietary menus, this selectivity is not without cost.¹² Too, the degree of selectivity possible under the proposed algorithms is not sufficiently wide for the average restaurant.

The significance of the work done by Balintfy and others to the investigator interested in planning and control

systems for public eating establishments is that they have proven that it is possible to maintain and manipulate recipe and food ingredient files at reasonable cost on the computer. At this point, Balintfy's food use program is of more value and significance to the public food service operator than his remarkable development of usable menu planning algorithms.

In essence, two files, one containing all food ingredients used in an operation, the other containing recipes which in turn are made up of food ingredients can be combined with census forecasts to produce a food requisition for any given period of time. This concept, of course, is similar to the parts explosion problem in a job shop. This concept, however, had been generally considered unworkable for a food service operation because of the large number of combinations and the short periods of time involved. The fact that the concept has been installed and is working in several hospitals and other institutions has done much to awaken investigators to the possibility of using the technique in commercial operations.

Summary

In summary, it is clear that commercial food service operators seldom come anywhere near optimizing the most essential aspect of their operations--the menu. The menu planner must deal with a large number of variables and

organize these variables into some relationship that will tend to lead to various goals. Some of these goals, such as maximum customer choice and maximum profit, are incompatible. The need to work with cost/price/volume data is apparent. This body of data, however, is seldom available in a form that is of use to the menu planner. There is a need for this information, along with a method of quickly determining the potential of various combinations of menus and menu items on specific menus.

Forecasting

Current industry methods of forecasting vary from establishment to establishment with much of this function carried on quite informally in a large number of food service operations. Where no formal forecasting procedure is used, managers and chefs rely on experience and intuition to guide them in deciding on amounts to purchase and produce. Although this lack of systemized planning may not seriously affect a small operation, it may create considerable inefficiencies in larger restaurants.

Forecasting for food planning and control is relatively short-term demand forecasting. Long-term budget or sales forecasting, used as an aid in the overall financial planning, is not considered here. Rather, the concern is with forecasting for two primary purposes: 1) to estimate the needed amounts of raw materials in order to plan for

purchasing and production, and 2) to arrive at the potential contribution of each menu toward costs and profits.

In order to serve both purposes it is first necessary to estimate the number of covers to be served and the number of sales of each menu offering. As this function is heavily reliant on past events, it is necessary to maintain a history of past sales.

Recording sales

It is a normal practice to record sales either through scoring a menu card or through the use of some form of multi-counter. Recently, the National Cash Register Corporation has introduced a machine that effectively totals both number of item sales and individual dollar totals for these items. The current cost of this device, however, presently precludes its use in all but large operations. This recording may be carried out by a food checker or by the restaurant cashier. These totals are then sent to the food cost accountant to be recorded in some type of sales analysis record.

Sales analysis record

One type of sales analysis form consists of a thirty-day columned sheet on which menu items are entered as they appear during the month (see Figure 4). As items are repeated throughout the month it is necessary to find where they have been previously posted. This is one disadvantage

COFFEE SHOP LUNCHEON			DATE	5/1	5/2	5/3	5/4
			DAY	M	TU	W	TH
			WEATHER	RAIN	CLEAR	CLEAR	CLOUDY
			HOUSE COUNT	607	720	701	685
			MEALS SERVED	343	356	364	350
			SPECIAL EVENTS	NONE	NIGHT BASEBALL	FLOWER SHOW	NONE
PORTION COST	ITEM	SALES PRICE	PORTIONS	SERVED			
20	Noodles + Mushroom	50	22/42				
25	Frankfurter + Beans	70	53/48		34/38		
39	Calf's Liver	100	12/29				
20	Vegetable Plate	65	17/14				
33	Irish Lamb Stew	90	42/47				34/40
15	Poached Egg on Codfish Cake	80		21/49			
20	Chef's Salad Bowl	70		28/25			
23	Patty of Sweetbread	85		20/28			
18	Ravioli	75		31/19			
22	Chicken Croquettes	90		27/33			
27	Filet of Sole	80			20/11		
28	Lamb Kidney on Toast	95			15/13		
21	Chicken Salad	85			21/38		
16	Baked Macaroni	60			37/44		
23	Smoked Whitefish	85					13/16
17	Patty of Chicken a la King	80					21/23
26	Ham + Eggs	85					31/39
18	Omelette	60					21/30

Figure 4.--Sample of a daily sales analysis record.^a

^aJoseph Brodner, Howard Carlson and Howard Maschal, Profitable Food and Beverage Operation, 4th rev. ed. (New York: Ahrens Publishing Co., Inc., 1962), p. 381.

of this system. The advantage of the system is that it is possible to have the entire month's sales at hand and also to determine what the sales mix was for any particular day.

Another method often used is that of maintaining a card file for each menu item counted. This has the advantage of ease of locating an item in question. The disadvantages are those of losing the overall recent sales picture and the difficulty of determining the relationship of the item to other items sold on a particular day.

Other information than that of actual sales totals needs to be recorded on the sales analysis sheet. The ratio of the number of sales of individual items to the total is useful information both as an aid in the future for forecasting and to determine the relative popularity of a dish. Items that consistently carry an unusually low ratio to total sales may be dropped from the menu (unless they happen to be the favorite dish of the owner's mother-in-law). The operator may also be interested in the proportion of daily entrees that are sold to the total number of patrons. A shrinking of this ratio in favor of sandwiches or other lesser margin-producing a la carte offering may be an indication that something is amiss, either in the selection of du jour items being offered or in the price structure.

Other information which should be maintained for the use of the forecaster includes:

1. Date.
2. Day of Week.
3. Weather.
4. Special Events.
5. Total Covers.
6. Run out Times.
7. Remarks re unusual occurrences.

All these items can affect the pattern of sales for any given day.

Sales patterns and total sales will vary with the day of the week. Sunday patterns are usually unlike any other day. Friday patterns may show a seafood influence, although this pattern has weakened over the past few years. Lighter items tend to sell well on Mondays and after holidays. In certain situations payday may mean that a better sale of higher-priced items can be expected.

Weather changes affect each operation differently. Those restaurants with relatively more remote locations may suffer in inclement weather; establishments close to transportation facilities may gain. An unseasonably warm day may change sales patterns from the expected.

Special events, such as conventions or area sporting events, may drastically alter a normal sales pattern.

If an item has run out early in a meal period the recorded sales for that item will not be a reliable forecast indicator. Some adjustment will need to be made to account for the early sellout.

There are a number of other variables that may affect sales for any given day. Among these may be labor shortages that cause service breakdowns, production mishaps that generate the same result, or the death of a President that causes potential customers to remain glued to their television sets.

One other factor that enters into the total forecasting process is the banquet trade carried on by the establishment. This type of variable is categorized by Brown as a prediction rather than a forecast variable.¹³ By this it is understood that it is possible to predict the effect of the variable with a high degree of certainty. To plan the inclusion of this type of variable is a mechanical process--the need being simply that of making sure that the sales represented by predictive variables are included in the total. The record of banquet sales is usually maintained as a separate part of the sales history.

Methods of forecasting

The actual forecasting is done well enough in advance of the day of sale to provide sufficient lead time for purchasing. This time may vary from company to company. If necessary, the forecast is adjusted as the day of sale approaches to account for any perceived changes in the forecast variables.

The authors of Profitable Food and Beverage Operation recommend that forecasting be done at a forecast meeting attended by the chef, the steward, maitre d'hotel, head checker, food cost accountant, and a representative of the manager.¹⁴ Many operations involve more than one person in the forecasting procedure although there would appear to be an optimum number of participants with the number being large enough to include different points of view, yet small enough to function efficiently.

As has been indicated, heavy reliance is placed on the sales history as a guide to the actual forecast. To this historical information is added the judgement of the forecasters as to the effect of certain assumptions they make concerning the future. These assumptions may include such variables as recent sales trends, the effect of special events, and the effect of demand cross elasticity resulting from a particular sales mix. If a single menu or cyclical menu pattern is used the latter variable can be considered historical rather than assumptive--improving the accuracy of the forecast.

Some establishments pre-cost their menus to determine what sales, costs, and ratios would be based on forecast covers. Brodner, Carlson, and Maschal recommend that this be done by applying the forecasted portions to the individual costs and sales to arrive at the anticipated revenue and costs for the menu.¹⁵

The advantage of utilizing forecasts to pre-cost menus is that it enables the operator to adjust his menu so that he can anticipate his sales and costs. Additionally, of course, he can also predict his food cost ratio and his variable margin. Ideally, he would always be able to adjust his menu offerings to meet any desired standard.

Problems in forecasting.--In practice, restaurant people do not normally have the information available to carry out a menu pre-cost. The time involved in gathering, updating, and calculating recipe costs simply is too costly to support the pre-costing advantages. Even if recipe costs are known for main items some sort of an average cost of surrounding items must be used. If this cost is inaccurate it may cause considerable overall inaccuracies in the pre-cost procedure. Forecasting covers and portion totals is a task that is carried out fairly subjectively with considerable reliance on historical information. No formula method of utilizing these variables is currently in wide use. Some means of collecting, maintaining, and manipulating this data is sorely needed in order to carry out the forecasting function efficiently so that maximum use can be realized by the restaurant operator.

Purchasing

In the area of purchasing we find a considerable range of procedures with most of the differences being attributable to the size of the establishment. The owner-manager of a small establishment may do his own purchasing, another may turn it over to his chef. Larger companies have purchasing agents or stewards, many have large purchasing departments. Still other very large companies do their purchasing through a subsidiary organization that has a separate corporate structure. Within these various types of purchasing set-ups, however, there are certain fundamental steps in which they all engage.

It is possible to distill certain general practices now being followed by better food service operators in the area of purchasing. By doing so, we can better establish the background against which data to serve the purchasing agent can be made available.

Good food purchasing

Good food purchasing can probably be best described as having the right product, at the right place, at the right time, and at a price the purchaser wishes to pay.

It is obvious that food purchasing, like the procurement function in any manufacturing enterprise, has much influence on the success or failure of the firm.

Anyone can pick up a telephone and give an order to a purveyor, but ordering is not purchasing. We must accept the fact that purchasing or buying is a complex activity with well-defined procedures which must be followed in order to achieve good results.

It is possible to break the knowledge needed by a food purchaser into five areas:

1. Knowledge of the needs of the establishment.
2. Knowledge of the market in which he buys.
3. Knowledge of the products he must purchase.
4. Knowledge of the procedures he must use.
5. Knowledge of the results, including the receiving and storage of his purchases.

Knowledge of the needs of the establishment

Figure 5 shows the relationship of the various components involved in the flow of food through a typical food service operation. It becomes clear from this illustration that all food purchasing is dependent upon a number of parameters that are characteristic of the particular firm for which the purchasing is being done.

In a previous section the relationship of the menu to purchasing was considered in some detail. It is sufficient here to reiterate that the menu determines what is to be purchased. There may be some temporary advantage to turning

this sequence around and fitting the menu to "good buys," but it is impossible to maintain the desired character of the operation if this becomes the standard procedure. We have also indicated that a cyclical menu can be of much help to the food buyer. He knows well in advance which items he must purchase and is able to concentrate on becoming familiar with these products. Also, by lending itself to more accurate forecasting, the cyclical menu aids in pinpointing the quantities needed.

The forecast, combined with the menu, provides the necessary information concerning quantities of the particular needed raw materials. In this sense the menu is considered as a list of recipes that are, in turn, lists of food ingredients. Implicit in this scheme is that the recipes have been developed with a standard service portion as a base. That is, the quantities of raw materials needed in a particular recipe are factors of portion size times the number of portions the recipe is geared to produce.

Once the gross amount of needed raw materials is known, the purchasing agent must refer to his inventory to determine the net amount of raw materials needed. As indicated in Chapter III, purchasing is normally carried on as a two-step process with staple items purchased according to some formal or implied par-stock system and most perishable items ordered as needed. This implies that

the quantities of a large number of inventory items are not dependent on any one menu forecast. It is true, however, that many of the items purchased on a daily basis to satisfy the needs of a particular menu are the most significant items in terms of cost. Meats, fish, and poultry fall into this category, for example, and these items alone account for approximately 50 percent of the total food cost dollar.¹⁶

Inventory controls vary from nonexistent to perpetual controls maintained on computer files. In those operations where size precludes full-time storage controls the usual practice is to take monthly inventories and to make visual checks on current stock when necessary. To all intents and purposes, effective control simply does not exist. Even where store clerks are used and an issuing system is in effect, there may exist a wide gap between what the cardex or other record indicates is in stock and the actual goods on hand because items are not properly recorded as they pass in and out of storage. There is usually no attempt made to maintain an accounting control on goods outside of controlled storages, such as raw materials in the production area. This practice can often be justified, however, on the basis that a relatively small portion of any current inventory is in noncontrolled storages and that the effect of any changes from accounting period to accounting period will balance out over time.

A common industry practice is to price food inventories on a modified FIFO basis.¹⁷ It is modified in the sense that most establishments apply the last price to all like goods in storage at the time inventory values are calculated, causing costs to be overstated in a time of rising food costs and overstated if costs are falling. This practice obviously affects raw material cost calculations to some extent but is excused on the basis that there is normally a very small proportion of the older stock on the shelves.

A problem for restaurant operations regarding inventory control is the fact that it is necessary to control a large number of items moving in and out of storage compared to the dollar value of the sales of these items. This creates pressure on the establishment both in the area of physical control of the goods and in maintaining the requisite files to communicate to management the current status of the raw materials inventory.

It is appropriate at this point to indicate that a food purchaser is dependent on good specifications to define, in a market sense, the items he must purchase. This definition is based upon the needs of the establishment relative to the quality, size, performance, and numerous other standards that may be applicable to various products. The reputation of the establishment depends upon the maintenance of certain product standards. These

finished-product standards are largely dependent on the raw-material standards utilized in the purchasing of food for processing.

In Figure 5 capital on hand is shown as a modifier applied to purchasing decisions after considering the menu, forecast, inventory, and specifications. This indicates that the assumption is made that there is enough capital to make current purchases and that capital considerations usually are significant only in those cases where the purchasing agent is considering buying quantities beyond current needs. He may be inclined to purchase for future needs when offered a price break on quantity purchases, expects prices to rise in the future, or feels that he must protect himself against an expected shortage of an item.

It would appear that decisions regarding future buying are generally made only on the expressed cost of the purchase. Opportunity costs, storage costs, and cost of capital are not factors in the decision. As a consequence, numerous questionable decisions in regard to future purchases are the order of the day.

Knowledge of the market

Operators have numerous choices among the various sources of supply to fill the food needs of a food service establishment. Regardless of which one, or which

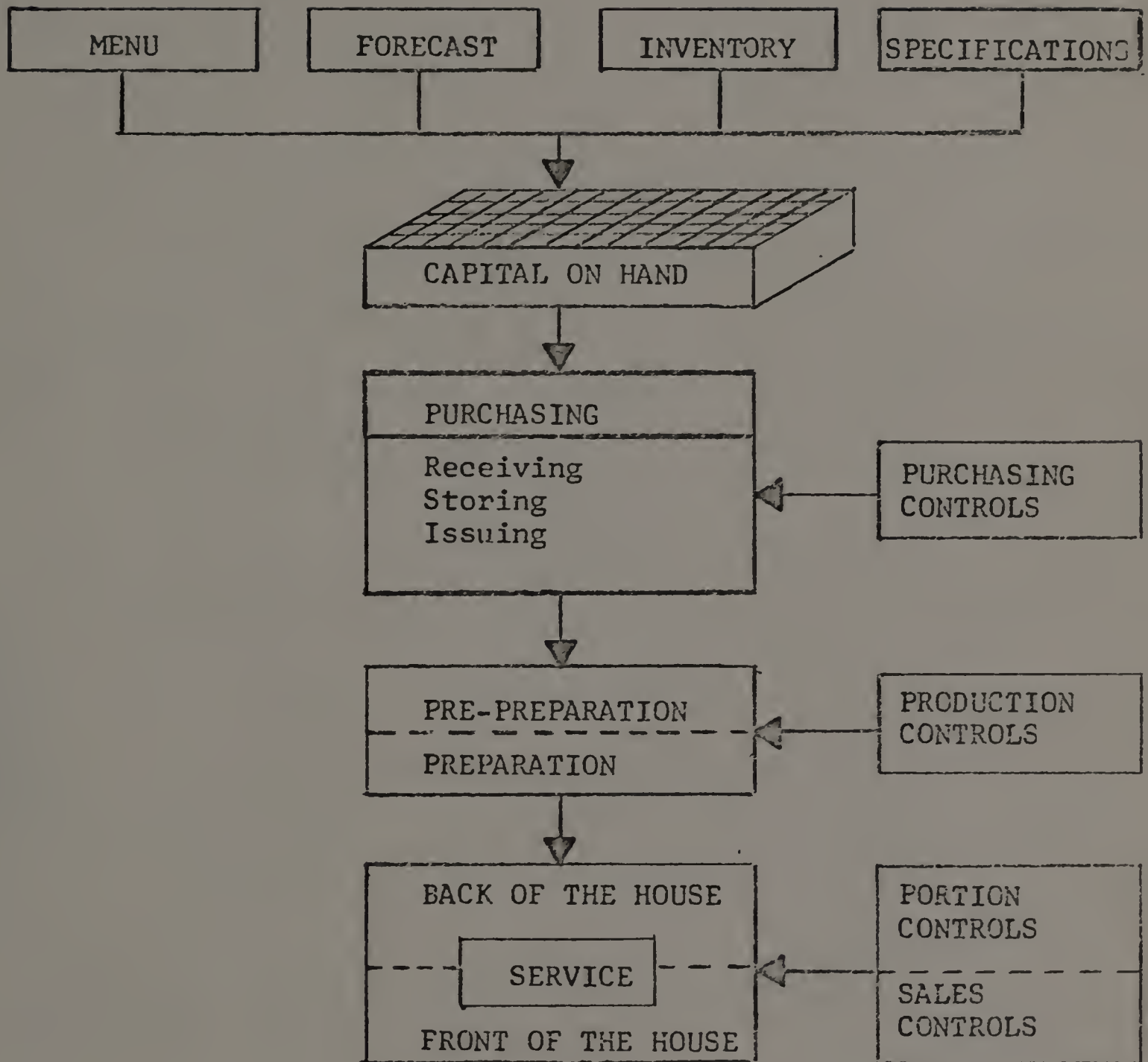


Figure 5.--The food purchasing system.

combination, is selected, they should have a good knowledge of the market in order to buy most effectively.

Knowing the market involves finding out what sources of food are available; what foods can be obtained from each purveyor; and what the qualities, brands and price ranges of the food are. It also means maintaining contact with the market to determine which supplies can best meet the needs of an establishment at a given time.

Knowledge of the product

It is, of course, necessary that a good food service operator be knowledgeable concerning the raw materials of his trade. This knowledge includes such areas as grades, other food standards, and specifications writing.

Knowledge of the procedure

A good purchasing procedure includes the use of specifications, proper ordering procedures, and proper record keeping. Lack of a proper buying procedure often nullifies the operator's knowledge of establishment needs, market, and the product. Also, a properly organized purchasing procedure is important to the buyer in time saved, in eliminating error, and in assuring that the right foods are delivered at the right time.

A good buying procedure involves a systematic market search, systematic control of purchase orders and ordering times, developing good relationships with purveyors, and

other procedures that facilitate the purchasing process.

Use of specifications

Clear, written specifications are key factors in any good food purchasing system. The importance of having a clear, concise, written set of food specifications is lost if they are not properly used in the purchasing procedure.

Copies of the specifications should be put into the hands of the suppliers. This enables the seller to know exactly what the buyer wants when he orders a product. It also provides a means of resolving differences with the supplier when products are delivered which are not satisfactory. Some establishments send out a list of foods needed, with the specifications stated for each item, to two or three suppliers. Each supplier inserts the price at which he will supply each item and returns the list. The buyer then telephones the supplier who gets the order.

Some operations simplify the use of specifications by organizing them into a book and assigning a code designation to each specification. This provides positive identification of each item without a lengthy explanation on the purchase order form.

Ordering staple items.--If ordering is done at regular intervals, a par-stock can be established and used as an ordering guide. A normal usage over the lead-time interval

is established and a safety-stock amount added to this. At ordering time the buyer replenishes the stock to the predetermined par.

The mini-max principle can be used when ordering can be done at any time or when certain order quantities are most desirable in terms of economy. A safety stock is set to cover the lead time and this becomes the minimum stock or reorder point. When this point is reached the order is placed.

Although Balintfy and others have suggested inventory control formulas that have the potential of being used by the industry, the lack of useful data, the difficulty inherent in changing long-established buying patterns, and the lack of empirical testing in this area appear to have resulted in little change in food-buying practices.¹⁸

Standing orders with purveyors are quite commonly used for certain products. If the supply of goods on hand is closely watched and any buildup or depletion of inventory corrected immediately, they can be used successfully. The danger in using standing orders is that the purchaser often fails to provide proper supervision of the current inventories, with resulting discrepancies because of either dishonesty or oversupplying on the part of the purveyor.

Knowledge of receiving and storage practices

Good purchasing does not end with the giving of the order to the vendor. To insure that good purchasing practices are not wasted, it is necessary for the operator to determine that the goods received at the establishment are the exact goods ordered. In addition, the handling of the goods after they are received is most important in the preservation of quality and quantity. This can be translated into the need for the maintenance of good receiving and storage practices.

Receiving

If the quantity and quality of incoming merchandise are not inspected carefully, the use of detailed purchase specifications and careful buying are to no avail. Food cannot be profitably resold if it did not arrive, was in short weight, or was delivered in poor condition.

How receiving is done varies considerably among food service establishments. There are, however, certain principles governing this control.

According to Lukowski, the basic rules of receiving in a food service operation are:

1. Accept the merchandise.
2. Inspect the merchandise to see if the products agree with the invoice.
3. List all items received on the receiving clerk's daily report.

4. Deliver the merchandise to the storeroom or kitchen.
5. Inspect the merchandise to determine if it is in agreement with the specifications.¹⁹

How these practices are performed depends upon a number of variables including the size and type of establishment, available facilities, and the kind of control system used.

Receiving responsibility.--Ideally, a food service establishment should have a full-time receiving clerk with specific responsibilities. The clerk should be a member of the auditing staff and should report to the auditor. Many operations have the clerk reporting to the steward, chef, or purchasing agent, thus violating a basic principle of control.

A large number of smaller establishments either use the receiving clerk as a stores clerk in addition to his receiving duties or have no receiving clerk. Of those establishments who have no clerk, some take the logical step of assigning another employee to part-time receiving duties with responsibility for this function. Unfortunately, a large number of operations leave receiving responsibilities to the person nearest the door when the delivery arrives. The result is a complete lack of attention to this important area of control and the loss of any effective check on purchasing.

Receiving records.--Figure 6 illustrates one type of receiving record, usually known as the Receiving Clerk's

RECEIVING CLERK'S DAILY REPORT

INVOICE NO.	FROM WHOM PURCHASED	UNIT	AMT.	ARTICLE	UNIT PRICE	TOTAL AMT.		FOOD DIRECT		FOOD STORES	
23406	By-The-Way Meats	lbs	75	Beef round,Choice	.59	43	25			43	25
"	"	lbs	25	Short loin,Choice	.95	23	75			23	75
"	"	lbs	32	Rib of beef,Choice	.56	17	92			17	92
4760	Adel Dairy	gals	30	Milk	.70	21	00	3	50	17	50
"	"	½pts	150	Milk	.06	9	00	9	00		
"	"	gals	15	Ice Cream	.99	14	85			14	85
6789	Happy Hour Bakers	loaf	25	Bread,white	.25	6	25	6	25		
"	"	loaf	10	Bread,dark	.28	2	80	2	80		
23407	Hill's Produce	head	48	Lettuce,head 24/per/c/s	.20	9	60	4	80	4	80
"	"	lbs	15	Asparagus,fresh	.13	1	95	1	95		
				TOTAL FOOD RECEIVED		150	37	28	30	122	07

SIGNATURE

Figure 6.--Sample receiving clerk's daily report form.^a

aLukowski, p. 17.

Daily Report. The purpose and function of these records is to record all incoming food deliveries. Each delivery should be accurately recorded for date of delivery, quantity, price, and amount of each item received. Done properly, this record then becomes a basic link in the operation's food cost control system.

In addition to recording quantity, prices, and amounts, the receiving record also indicates the disposition of the incoming goods. Deliveries are generally divided into Food Direct and Food Stores.

Purchases that are sent to storages from which they will later be requisitioned by the production department are classified as Food Stores. This includes all types of storages, including refrigerated and frozen.

Purchases such as milk and bread that are sent directly to production for temporary storage and are not later requisitioned are classified as Food Direct. It is assumed that these foods will be used on the day they are received so that the total of this column of the Receiving Clerk's Daily Report serves as the daily requisition for those items.

Storage

Storage is important in the overall operation of a food service business because it is the link between receiving and preparation. Storage performs a holding

function in which quality can be retained or lost. It also serves as a major food control point.

Food is placed into various storages by the receiver or storeroom clerk and is issued from these storages to the various preparation centers. In some food service operations the storeroom clerk is responsible for maintenance of the price book or index and prices all requisitions. Requisitions are then sent to accounting for extension and totaling. Other establishments hold the storeroom clerk responsible only for the items and quantities of these items that leave the storeroom.

The great majority of establishments without storeroom clerks utilize a variety of methods to attempt some control over the storage area. Certain times of the day may be set aside in which goods can be requisitioned--usually a bottleneck for production when the inevitable item, forgotten at issuing time, is needed. Another method is to tack a sheet on the storeroom door for employees to note items taken from the storeroom. It appears to be a time-tested fact that this is the first thing a new assistant manager does after straightening out the storeroom. For rather obvious reasons, this hopeful attempt at control is seldom successful. A great many managers simply open the storeroom doors in the morning and hope that nothing is taken--a rather forlorn possibility in the usual scheme of things.

Like other aspects of food control, storeroom control is complicated by the large number of items handled along with their relative perishability. Where storeroom records are kept, it is usual to use some type of card file to record purchases, requisitions, and goods on hand. Bin cards are sometimes used in food storerooms; but their greatest use in the restaurant industry is in liquor and wine storerooms.

A number of companies are using computer assisted storeroom controls. These systems are, for the most part, based on the use of punch cards to follow items on their route through the departments. This affords better inventory control with most of the problems in the system centering around generating, and keeping track of the cards.

Johnson and Moore, describing the inventory and control system they developed at the University of Missouri Medical Center, indicated that, in addition to the above problems, considerable effort had to be expended in training employees to operate the system. They feel that methods that would eliminate use of cards for data transmission--i.e., on-line systems--would be preferable to the use of cards.²⁰

Cost of food storage is considered a fixed overhead item by most food service operators (when it is considered at all). In a study conducted by Lukowski, Eshbach, and Wrisley, an attempt was made to allocate storage costs to

recipes--along with those of receiving and issuing.²¹

Although the project is technically feasible, the problem of a meaningful basis for allocation tends to make the effort less meaningful than could be hoped. Operators are aware that there is expense involved in creating storage space and in the maintenance of equipment. In going operations, however, the fact that the space has already been committed removes it from the consideration of the operator when cost reduction possibilities are in order. The fact remains, that better control over inventories can lead to reduction in storage costs.

Summary

The food service operator needs to relate to five areas of knowledge in order to do a competent job of purchasing. These areas include: knowledge of the needs of the establishment, knowledge of the market, knowledge of the product, knowledge of the procedure, and knowledge of the results--an area which includes receiving, storage, and issuing.

Although this functional area is a critical one in the planning and control of a food service operation, many restaurants have no systematic plan for coordinating purchasing with other aspects of the operation of the establishment. Purchasing, then, is another area in which

the lack of data and facilities for manipulating such data works to the disadvantage of the enterprise.

Computation and Use of Food Costs

There are two aspects of food cost computation that are of interest to the food service operator. The first of these is the computation of costs of raw materials used in a given period of operation to enable him to calculate profit and to maintain his historical bookkeeping records. The second involves the use of various categories of food costs as managerial tools for increasing the efficiency of the operation, planning purchasing, and for use in menu pricing. The latter two uses of item food costs were covered in previous sections.

This section will describe the major method of computation of food costs for the various categories of uses. It will also describe how these costs are utilized.

Overall cost of food

The basic formula used in calculating cost of food is the same as that used for any raw material use: cost of purchases for the period are added to the opening inventory to obtain cost of goods available for consumption; the closing inventory is then subtracted from this figure to arrive at the cost of food used. It is at this point that differences from the usual equation appear. Although the cost of food used is the total food expense for a restaurant operation,

it does not represent the cost of food sold.

One reason for this discrepancy is that most food service operations feed their employees as an additional benefit of their employment. The cost of the food served to employees is clearly a wage cost and should not be considered a part of the cost of raw material.

A second cause of the difference between food used and food sold is the practice of most food service operations of transferring food to other non-food departments. This is usually the beverage department. Food items such as fruit and sugar are purchased primarily for use in customer meals and are requisitioned by the bar as needed. Transfers also run in the opposite direction with wines and liquors being transferred from the bar to food for cooking purposes. The cost of food must be adjusted to reflect the net effect of these transfers before a figure for the cost of food sold can be reached.

Food cost as a management tool

In order for management to use information about the cost of food sold as a basis for correcting inefficiencies in its operation it is sometimes necessary to make further adjustments when calculating the cost of food sold. These adjustments revolve around kinds of sales made by the enterprise that are clearly not representative of the major thrust of its business. These sales can be classified as steward's

sales or discount sales.

Steward's sales are sales made by the establishment at cost. These come about when employees or customers wish to purchase raw materials from the establishment--usually because they are not readily available through the usual retail sources. As a courtesy (and usually against the better judgement of the management) this type of request is handled at cost.

Discount sales may occur for a variety of reasons. The usual situation is that of the operator who does not give meals to employees but sells them at a discount. A different type of discount sale may occur when products made by the restaurant are sold over-the-counter for consumption off the premises, when this type of sale is only incidental to the operation.

It is clear that both steward's sales and discount sales should be separated from the regular food sales before cost calculations are made; otherwise it would be difficult for management to determine exactly why certain cost deviations might occur, particularly if the amount of these sales were significant.

A typical formula for calculating food cost for management purposes is:

$$I_1 + (P \pm T - S - E - D) - I_2 = C.$$

And the food cost percentage based on sales would be:

$$(C/GS - (SS + DS)) 100 = CP$$

where:

I_1 = Inventory at the beginning of the period,

I_2 = Inventory at the end of the period.

P = Food purchases for the period.

T = Net transfers.

S = Cost of steward's sales.

E = Cost of employee meals.

D = Cost of discount sales.

C = Cost of food sold.

GS = Gross sales.

SS = Steward's sales.

DS = Discount sales.

CP = Food cost percentage.

In the first formula the effect of transfers, food cost of steward's sales, employee meals, and discount sales are removed from the goods available for consumption and a cost of food served at full price from the menu is calculated.

In the second formula the steward's sales and the discount sales figures are deducted from gross sales to leave net sales from the menu so that menu costs can be shown as a ratio of menu sales. In practice, discount sales and steward's sales should be recorded separately from menu sales, but there is usually no practical method of separating the costs for these items.

If menu item costs were maintained, however, it would

be possible to calculate what the costs of these incidental sales should be.

A problem arises also in the calculation of employee meal costs. Without sales records or menu-item costs the best that can be done is to estimate the cost of employee meals, and this is the method generally used. Some operators make random spot checks on employee meals and compute an average per meal cost. Others simply choose a figure for the cost of each meal and multiply it times the number of employees served in the period.

A somewhat more accurate method of accounting for employee meals is to require that a meal check be created for each meal served. The total of these checks then represents the employee-meal sales for the period. The current food cost percentage can then be applied to this total to achieve an estimated employee-meal cost.

In the situation where it is desirable to keep track of the transfers to more than one department--a situation which may occur when food is charged out of a central kitchen or commissary to several distinct food operations--more than one transfer account may be kept.

Use of the overall food cost

It should be noted that food service operations other than commercial restaurants may use other bases than food sales. Hospitals, for example, may use patient-days as a

base and cost per patient day as management criteria. In commercial restaurants, however, the ratio of cost to sales is the indicator most used.²²

As the cost of food is a variable cost, comparisons can easily be made between periods with different sales levels. Comparison of costs from period-to-period tend to use historical costs as a standard for current costs. Comparisons with historical costs also indicate any trends that may be present regarding costs of food.

Another use of the figures is that of comparing enterprise and industry statistics. These comparisons may range from those with competitors down the block to published figures by larger firms or statistical studies carried out by industry accounting firms.

The most practical comparisons, of course, are those between actual costs and a budgeted figure. Figure 7 shows the relationship between actual and budgeted (desired) costs.

This figure indicates that the variance between actual cost figures and budgeted figures are measured and reported back to management. Management then has three options: it can change the budget; it can work to change the actual condition; or it can do nothing.

It is at this point that food cost control changes from a control tool to a control process. If, as is usually the case, management acts to change the actual condition, it must take positive action in the areas of purchasing,

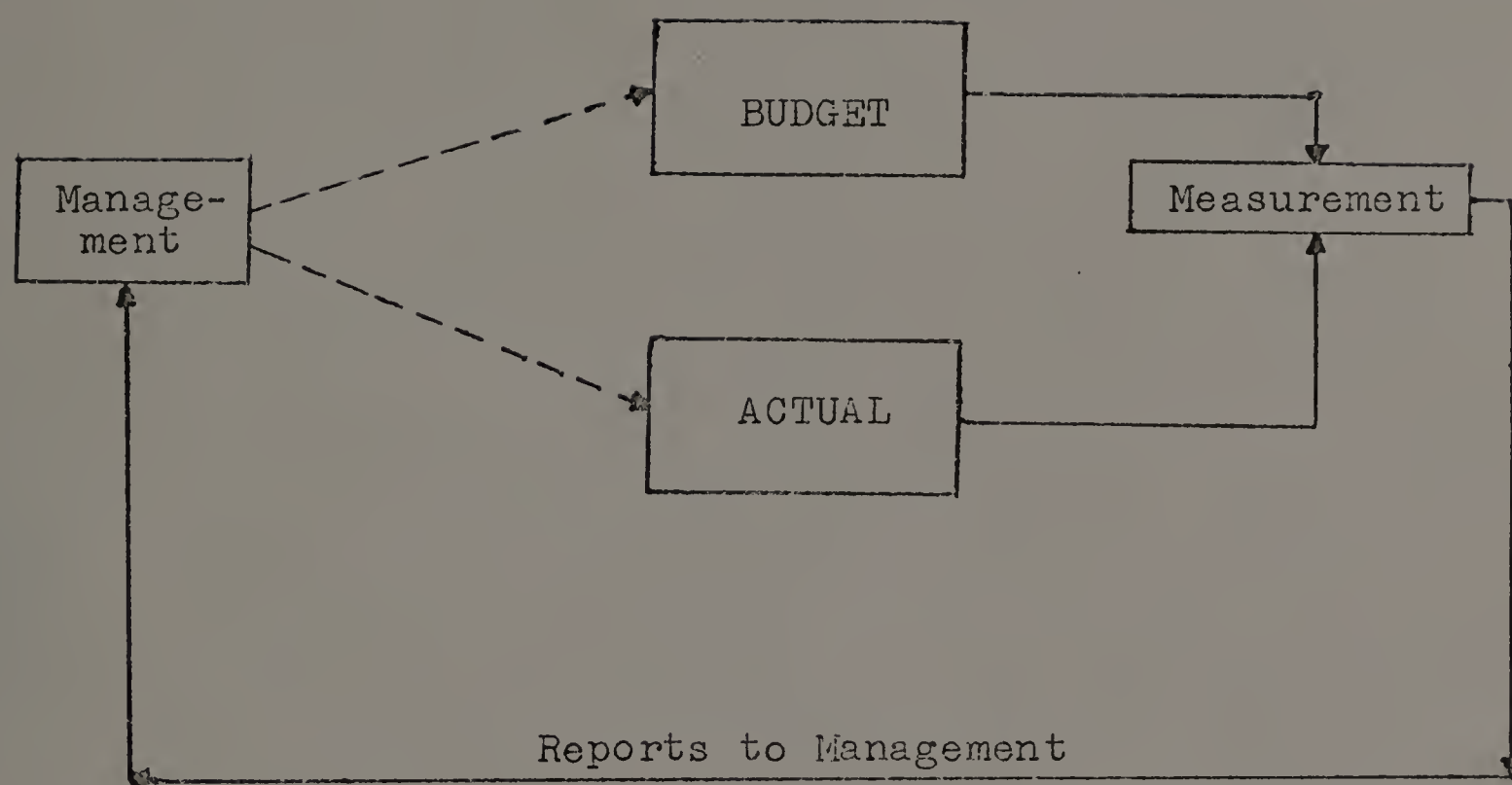


Fig. 7.--Relationship between actual and budgeted costs.

preparation, portion control, and any other area that may be the cause of unwanted variances from budget. With only a total food cost figure, this presents the problem of where to start looking. There are so many areas in which waste, theft, inefficiency, spoilage, or poor planning may occur that it is by no means obvious where the starting point should be. To provide a point of inquiry several kinds of cost breakdowns can be employed.

Breakdown of total cost

One method of breaking down total food cost to make it more useful as a management tool is to divide inventoriable

foods into categories. This breakdown can run from a minimum of three or four groupings to twenty-five or thirty. Purchase records and inventories must be set up in such a way that the groupings can be separated. A typical purchase record to achieve this is shown in Figure 8. In this case it is assumed that four groupings such as 1) fresh and frozen fruits and vegetables; 2) meats, fish and poultry; 3) dairy products, and 4) groceries (staples) are desired. When invoices are entered into the purchase record they are broken down into the various categories. The inventory sheets are set up by like groups and the cost calculations simply follow the pattern of those for total cost.

By calculating cost percentages of individual groupings the management is able to make historical comparisons of certain groupings and determine which group or groups may be out of line. If a product or product group is pinpointed as carrying too high a cost it is usually evident where the inefficiency lies. It is then necessary to check the purchasing, production, and service of these items.

Another method of breaking total cost into components is illustrated in Hotel Accounting, by Horwath, Toth and Lesure.²³ In their system, foods are separated into main ingredient groups, costs and sales are allocated to each group, and costs are then analyzed daily in relation to the sales of that cost grouping. Foods are first divided into the sub-departments where they are prepared and then into

PURCHASE VOUCHER

105

[illegible]

Figure 8.--Purchase voucher used to separate food purchases into categories to facilitate food cost control.

groups within each sub-department. Sales are analyzed on the basis of the waiters' checks. Menu items are grouped as closely as possible to relate to the ingredients on the cost sheet. Then costs and sales are compared on a percentage basis.

Breaking the food ingredients into groupings has advantages in that it is possible to pinpoint trouble spots with a relatively small amount of accounting effort.

The method used by Horwath, Toth, and Lesure, by their own admission, is time consuming and costly. There are other problems inherent in allocating to menu items several ingredients that cut across sub-department or group lines. The method does solve one problem that is a critical consideration in many food service operations--that of the timing of food cost information.

Daily food cost

A typical food service operator who inventories his stock once a month may then wait from one day to several weeks before his food cost is calculated. Obviously, even if it is calculated immediately--and if inefficiencies are demonstrated--he may be 30 days too late to take needed correction, as his inefficiencies may have started on the first day of the accounting period.

The time gap can be shortened by taking more frequent inventories. They may be taken twice a month or even weekly

and cost calculated in the usual way. The cost of control, of course, increases with the frequency of the inventory-taking and cost calculation.

Ideally, a daily cost shortens the time between infraction and discovery to a practical minimum. As Horwath et al., points out, "Food control must present the cost figures day by day. Food cost is subject to continuous fluctuations. Even with fairly constant sales, it may rise suddenly because of a change in the menu, because of incorrect pricing of seasonable dishes, or because of overproduction and waste. The rise may mean loss instead of profit."²⁴

The problem with conducting daily food costs by the regular method lies in the cost of daily inventories. The cost of inventorying hundreds of items daily becomes exorbitant. This problem can be overcome by estimating the cost through the use of requisitions and the daily receiving report. Other methods might include inventorying only certain key items or those items of highest cost.

An illustration of this method, taken from "Using Storage Controls to Simplify Determination of Daily Food Costs," by Wrisley is shown in Figure 9.²⁵

Part of this form is used for inventory. Columns 1, 2, and 3 are not used in figuring the food cost. They are a perpetual storeroom record.

The storeroom inventory at the beginning of the accounting

period is entered on the first line in column 1. The total of the daily purchases sent to the storeroom is obtained from the "Food Stores" column of the daily receiving record illustrated in Figure 10, and entered in column 2.

The total of columns 1 and 2 is entered in column 3; and this total, minus the daily storeroom issues from column 4, will give the next day's beginning storeroom inventory.

At the end of the month the inventory figure is checked against the actual physical inventory to ascertain the efficiency of the storeroom records. If there are major discrepancies, a check should be made to determine where control was lost.

The remaining columns, 4 through 13, are used for the data from which the daily and to-date food costs are figured.

Storeroom issues plus direct purchases equal gross cost of food used. The gross cost less transfers gives the net cost of food sold. (It is assumed that the operation used for the example does not have any steward's sales or employee meal cost--although they could be accounted for if necessary.) Total net costs and total sales for the accounting period are then carried forward to the "To-Date" columns and a to-date percentage cost is calculated.

This method of obtaining a daily food cost produces an estimated, rather than an actual, cost figure because the kitchen inventory has not been included.

RECEIVING CLERK'S DAILY REPORT

Vendor and Invoice Number	Quan.	Unit	Description	Unit Price	Amount	Purchase Journal Distribution			
						Total Amount	Food Direct	Food Stores	Sundries
Acme Provision A-324	3		#10 Solid Red Toast.	500	15 00			15 00	
"	2		#10 Blue Lake Green Beans	480	9 60	24 60		9 60	
Ben's Meats 4360	60	lb.	Rib of Beef-Choice	59	35 40			35 40	
"	25	lb.	Short Low-Choice	95	23 75	59 15	23 75		
Bell Dairy 2501	30	gal.	Milk	70	21 00		21 00		
"	150	1/2 pt.	Milk	06	9 00		9 00		
"	15	gal.	Vanilla Ice Cream	140	21 00			21 00	
"	15	lb.	Butter parts	70	10 50	61 50		10 50	
Ant's Produce 3315	1		Le Hue - 48 lbs.	800	8 00			8 00	
"	15		Cheerups - Fresh	13	1 95		1 95		
"	30	lb.	Tomatoes	20	6 00		3 00	3 00	
"	1		16oz. Vbl. Orange	400	4 00	19 95		4 00	
TOTALS					475 00	475 00	150 00	310 00	15 00

J. J. Smith

SIGNATURE

Figure 10.--Sample receiving record showing source of food stores and storeroom purchase information.^a

^aWrisley, p. 5.

This omission does not decrease the value of the cost figures to any great extent. There are several reasons for this.

First, most food service establishments tend to have about the same amount of leftovers or kitchen inventory from one day to the next. When that is true, the food cost figure is not affected materially by leftovers or kitchen inventory.

Second, the keeping of a running or "To-Date" cost tends to smooth out daily fluctuations after the first few days of the accounting period. By the end of the accounting period the "To-Date" figures should be very close to the actual cost figures.

Lastly, management receives the daily figures at a time when discrepancies due to more-than-usual amounts of leftovers, which may result from poor business or inaccurate forecasting, can be readily accounted for. For example, a high-cost day followed by a low-cost day (as leftovers are used up) is understandable and to be expected. Two or three high-cost days in a row, however, would be signal for management action.

One problem with this method centers around the first few days of an accounting period. Until enough figures are melded into the to-date calculations, it may be difficult for management to determine just what is going on--particularly if there have been unusual problems with forecasting,

weather, or production planning.

Another problem with daily food cost systems is that of pricing and extending the requisitions daily. This involves considerable book work in large establishments. And, of course, the problem always present with perpetual inventory systems, that of not being able to account for storeroom theft, is present with daily food cost systems that depend on means other than actually taking inventories.

In any case, actual physical inventory should be taken at frequent intervals, usually at the end of a monthly or four-week accounting period, to check the accuracy of the perpetual inventory records.

The problem of standards

Although grouping of items helps to pinpoint cost deviations, and daily cost calculations bring information close to the point of generation so that corrective action can be taken immediately, the problem of a proper standard of measurement still remains.

Historical costs indicate what has happened in the past and budgeted costs tell what management would like to have happen. Neither of these standards indicate what costs should be--based on the mix of items actually sold.

The ideal would be a standard cost system that would compare standard costs of the food sold with the actual food cost. The variance between standard and actual cost

would then serve as an indicator of the efficiency of the operation. As indicated in Chapter II, such a system is advocated by the accounting firm of Harris, Kerr, Forster. In the next section a look will be taken at this method--called "Pre-Cost, Pre-Control."²⁶

The pre-cost, pre-control system

The "Pre-Cost, Pre-Control" system is a two-part system. The pre-cost aspect of the system develops standard food costs based on forecasts; the second part develops standard food costs based on actual sales and then compares these costs with the actual costs.

As advocated by the accounting firm, menu item costs are calculated by adding to the cost of the menu item the cost of surrounding items, such as appetizers and vegetables, and these costs are then multiplied by the expected or forecast covers of each item. The forecast covers are then multiplied by the selling price to produce forecast sales figures. Figure 11 illustrates this procedure. The resulting forecast cost percentage then indicates to management whether or not the expected sales mix will produce the desired food cost percentage.

Theoretically, if the desired profit figures are not forthcoming, based on the pre-cost calculations, the menu mix can then be changed in order to produce this profit. Lower percentage cost items can be substituted for higher,

Form No. PC-PC 6A, HMF&CO.

DAY & DATE Sat. 6/10

HOTEL Metropolitan HOUSE COUNT 275

MENU PRE-COST AND ABSTRACT WEATHER Clear - Hot

Entree	Cost Per Ptn.	Forecast				Cost %	Actual Sales			Cost %	Ratio to Total*
		No.	Total Cost	Unit Price	Total Sales		No. Sold	Total Sales	Total Cost		
CLUB DINNERS											
Cheese Omelette	.40	3	1.20	1.25	3.75		4	5.00	1.60		3.16
Broiled Striped Bass	.52	10	5.20	1.40	14.00		12	16.80	6.24		10.61
Baked Ham	.57	18	10.26	1.50	27.00		20	30.00	11.40		18.95
Breaded Sweetbreads	.63	5	3.15	1.50	7.50		4	6.00	2.52		3.72
Roast Leg of Lamb	.78	17	13.26	1.55	26.35		20	31.00	15.60		19.53
Casserole of Capon	.66	9	5.94	1.80	16.20		9	16.20	5.94		10.24
Assorted Cold Cuts	.57	5	2.85	1.45	7.25		6	8.70	3.42		5.50
Total		67	41.86		102.05	41.01	75	113.70	46.72	41.09	71.83
A LA CARTE											
Special Prime Rib of Beef	.91	10	9.10	1.95	19.50		8	15.60	7.28		9.85
Chef's Salad Bowl	.29	8	2.32	.95	7.60		8	7.60	2.32		4.80
Fruit Salad	.21	15	3.60	.65	12.75		19	16.15	4.56		10.20
Half Spring Chicken	.60	3	1.80	1.50	4.50		1	1.50	.60		.95
Calf Liver & Bacon	.43	6	2.58	1.25	7.50		3	3.75	1.29		2.37
Total		42	19.40		51.85	37.42	39	44.60	16.05	35.97	23.17
GRAND TOTAL		109	61.26		153.90	39.81	114	158.30	62.77	37.65	100.00

* Popularity Index Ratio.

Figure 11.--Developing pre-costs and potential costs for a dinner menu.^a

^aBrodner, Carlson, and Maschal, p. 392.

for example.

Although it is not specifically advocated by the accounting firm it is also true that the forecasted variable margin for any given menu can be calculated from the pre-cost. As has been shown in the section on menu pricing, this margin is more important than the percentage figures.

After the menu has been offered, the actual sales for each item can be recorded in a similar fashion as shown in Figure 11. The result of these calculations is the potential cost of food for the menu. That is, if a restaurant were operating at optimum efficiency this would be the cost of food sold for the menu.

Before the standard (or potential) cost of food sold can be compared with actual costs, it is necessary to make certain adjustments. As actual cost is a total of all food used for the day the potential costs of all menus must be summed. If the establishment serves breakfast it is necessary to determine the cost on the basis of some percentage of sales. The number of possible combinations of breakfast items prohibits the calculation of the cost of each combination. One method of handling this problem is to cost out periodically the total cost of food served at breakfast to establish a reasonable percentage standard.

Another problem is related to those odd sales on any menu that are not standard price combinations. The guest who comes in at dinner and orders scrambled eggs is one

example. Brodner, Carlson, and Maschal suggest that this type of sales be included in a category, "A la carte other," and costed on the basis either of the overall percentage of sales for the particular meal or on the basis of periodic costing.

If the establishment caters to a banquet trade, the banquet sales are calculated at cost.

When the total potential cost for the day has been calculated it is compared to the actual cost. Figure 12 illustrates how this can be done for a hotel food service operation.

The difference between potential cost and actual cost, or potential savings indicates the degree of inefficiency in the daily food operation. The objective, of course, is to minimize this difference.

Problems of the pre-cost, pre-control system

The "Pre-Cost, Pre-Control" system, overcomes the major disadvantage of all of the other systems mentioned in that it uses a standard based upon the actual sales of any particular menu. The system also provides these figures on a daily and to-date basis, another necessary attribute of a good food-cost accounting system. Nevertheless, some problems do remain.

The major drawback of the system lies in the difficulty in calculating cost figures for the various menu items. In

DATE	April 22							
DAY	Saturday							
WEATHER	Fair							
	To-Day				Total Month to Date			
	Number	Actual	Calculated	Cost Per Dollar	Number	Actual	Calculated	Cost Per Dollar
	Sold	Sales	Cost	Sale	Sold	Sales	Cost	Sale
Coffee Shop:								
Breakfast	214	\$ 176.45	\$ 56.45	32.0	5,366	\$ 4,566.40	\$ 1,461.27	32.0
Lunches	92	86.45	28.12	32.6	2,902	2,710.05	907.80	33.5
Dinner	108	121.25	39.43	32.5	2,701	3,745.80	1,235.74	33.0
Buffet	-	-	-	-	743	1,671.75	977.75	58.5
A La Carte Entrees	84	89.95	36.68	40.8	1,460	1,352.15	449.58	33.2
A La Carte Others	53	170.10	53.75	31.6	1,173	3,751.93	1,203.14	32.1
Total	551	\$ 644.20	\$ 214.50	33.3	14,370	\$17,793.03	\$ 6,235.28	35.0
Cafe:								
Lunches	59	\$ 81.25	\$ 22.16	27.3	1,363	\$ 1,919.80	\$ 552.24	28.8
Dinner	62	147.60	49.18	33.3	1,602	3,447.80	1,135.82	34.4
A La Carte Entrees	56	207.63	79.31	38.2	1,592	5,222.39	2,004.52	33.4
A La Carte Others	45	126.52	43.72	34.6	850	2,204.82	776.83	35.2
Total	222	\$ 563.00	\$ 194.43	34.5	5,407	\$12,795.21	\$ 4,529.42	35.3
Dining Room:								
Dinner	180	\$ 589.90	\$ 186.27	31.7	2,060	\$ 6,702.35	\$ 2,313.71	34.5
Supper	44	103.75	35.90	34.6	372	880.60	302.24	34.3
A La Carte Entrees	58	212.75	102.42	42.1	664	2,252.70	1,045.45	46.4
A La Carte Others	17	342.95	127.04	36.5	423	3,371.40	1,226.71	36.4
Total	299	\$1,249.45	\$ 452.23	36.2	3,519	\$13,207.05	\$ 4,822.21	37.0
Room Service:								
Breakfast	21	\$ 124.10	\$ 37.47	30.2	1,499	\$ 2,174.30	\$ 658.99	30.3
Lunches	2	2.70	.66	24.4	114	174.35	44.56	25.6
Dinner	21	54.00	17.50	32.4	298	707.90	239.91	33.9
A La Carte Entrees	56	132.93	52.51	39.5	1,223	2,802.93	1,083.30	38.6
A La Carte Others	30	71.52	24.75	34.6	634	1,333.72	476.33	34.2
Total	130	\$ 385.25	\$ 132.89	34.5	3,768	\$ 7,213.20	\$ 2,503.14	34.5
Total Dining Room								
Potential Cost	1,262	\$2,246.90	\$ 964.05	34.9	27,064	\$51,042.61	\$18,145.94	35.5
Banquets	1,240	4,527.50	1,121.76	24.8	9,690	37,099.60	10,336.18	27.9
Total Potential Net Cost	2,502	\$7,374.40	\$2,115.81	28.7	36,754	\$88,142.21	\$28,482.12	32.3
S U M M A R Y								
Total Gross Cost-Actual	2,502	\$7,374.40	\$2,500.38	33.9	36,754	\$88,142.21	\$36,206.32	41.1
Less: Employees' Meals			265.00	3.6			5,736.58	6.5
Total Net Cost-Actual	2,502	\$7,374.40	\$2,235.38	30.3	36,754	\$82,405.63	\$30,469.74	34.0
Total Net Cost-Potential	2,502	\$7,374.40	\$2,115.81	28.7	36,754	\$82,142.21	\$28,482.12	32.3
Total Potential Savings			\$ 119.57	1.6			\$ 1,987.62	2.3
Net Dining Room Cost-Actual	1,262	\$2,246.90	\$1,113.62	33.2	27,064	\$51,042.61	\$20,133.56	33.6
Net Banquet Cost-Actual	1,240	4,527.50	1,121.76	24.8	9,690	37,099.60	10,336.18	27.9
J. J. Jones								
Food Cost Accountant								

Figure 12.--A daily recapitulation of costs, using the Pre-Cost, Pre-Control system.²

²Brodner, Carlson, and Maschal, p. 393.

an establishment with a changing menu the need for accounting for cost and price changes would be formidable.

Secondly, the inclusion of surrounding items at some average figure can result in a considerable cost deviation on any one day if customers tend toward the higher-cost accompaniments. On the other hand, the cost of maintaining sales and cost figures for these items in a hand system would be more than the additional verification would be worth. This same difficulty exists in relation to those items in the "A la carte other" category.

A third comment does not relate to the system itself, but to its use. As indicated in the section on menu pricing, the restaurant operator should be interested in his variable margin rather than food cost percentages. The use of the "Pre-Cost, Pre-Control" system to compare forecasted, potential, and actual variable margins, as well as potential savings, would help to emphasize the importance of this figure to the operator. One operator expressed the concept with beautiful simplicity. His comment was, "You can't put percentages in the bank."

Summary

In this section we have described the major methods of calculating and using food cost figures. All of the methods have certain drawbacks in either calculation or application. In the next section we will describe a systems model that

draws on the currently used systems, but adds certain refinements and computer assistance not currently in use.

FOOTNOTES

¹Personal observation by the author over a period of some thirty years. During this time he has been connected with the food service industry--either as an operator or as an instructor in food service management practices.

²Brodner, Carlson, and Maschal, p. 30.

³Ibid.

⁴Ibid., pp. 327-336.

⁵Commercial Kitchens (New York: The American Gas Association, Inc., 1962), p. 104. (The space allowed per seat for popular-priced restaurants is 11-13 square feet. For deluxe restaurants, the recommendation is for 13-18 square feet.)

⁶John M. Welch, "Analyze Your Food Cost," Circular 723, University of Missouri Agricultural Extension Service, July, 1960, pp. 2-3.

⁷G. J. Stigler, "The Cost of Subsistence," Journal of Farm Economics, XXVII (1945), 303-314. Victor E. Smith, "Linear Programming Models for the Determination of Palatable Human Diets," Journal of Farm Economics, XXXXI (May, 1959), 272-283.

⁸Joseph L. Balintfy, Computerized Dietary Information System (3 vols.; New Orleans, La.: Tulane University School of Business Administration, 1967).

⁹Joseph L. Balintfy, "Computer Assisted Menu Planning," Working Paper 41, Tulane University, Graduate School of Business Administration (undated), p. 3.

¹⁰Ibid., p. 48.

¹¹Ibid., p. 24.

¹²Ibid., pp. 36-40. R. Gue and J. Liggett, "Mathematical Programming and Hospital Menu Planning," Industrial Engineering, XVII (August, 1966), 395-400.

¹³Robert G. Brown, Statistical Forecasting for Inventory Control (New York: McGraw-Hill Book Company, Inc., 1959), p. 3.

¹⁴Brodner, Carlson, and Maschal, p. 390.

¹⁵Ibid.

¹⁶Personal observation of the author. This ratio held true in each of the several food service operations he managed over a period of years. It is a well-known fact that many food service operators multiply the meat cost of a dish to establish the selling price for the item. See, also, Charles Eshbach and Albert L. Wrisley, "Purchasing Food for Food Service Establishment," Food Management Leaflet 10, University of Massachusetts Cooperative Extension Service (1965), for a more complete discussion of food purchasing practices.

¹⁷This has been true in each of the operations with which the author has been connected. The gross sales of these operations ranged from \$50,000 to over \$2,000,000 annually. Conversations with other food service operators confirm this.

¹⁸Joseph L. Balintfy, "On a Basic Class of Multi-Item Inventory Problems," Management Science, X (January, 1964), 287-297.

¹⁹Robert Lukowski, "Receiving Food in Food Service Establishments," Food Management Leaflet 3, University of Massachusetts Cooperative Extension Service (1963).

²⁰R. A. Johnson and Amy N. Moore, "Inventory and Cost Controls by Computer," Journal of the American Dietetic Association, XLIX (November, 1966), 413.

²¹Robert Lukowski, Charles Eshbach and Albert Wrisley, Conducting Educational Work with Operators of Food Service Establishments: Cost Analysis Procedure, Food Service Manual Number 2 (Amherst, Mass.: The University of Massachusetts Cooperative Extension Service, 1963).

²²See: Harris, Kerr, Forster and Co., Pin-Pointing Your Profits: Ten Case Studies in Actual Restaurant Operations (New York: Ahrens Publishing Co., Inc., 1958), for an example of the use of the ratio of cost of food to sales as a management tool.

²³Ernest B. Horwath, Louis Toth, and John D. Lesure, Hotel Accounting (3d ed.; New York: The Ronald Press Co., 1970), 310-345.

²⁴Ibid., p. 312.

²⁵Albert L. Wrisley, "Using Storage Controls to Simplify Determination of Daily Food Costs," Food Management Leaflet 5, University of Massachusetts Cooperative Extension Service (1962).

²⁶Brodner, Carlson, and Maschal, pp. 376-395.

C H A P T E R V

THE PLANNING AND CONTROL SYSTEM

In Chapter III the needs of the industry in several areas were discussed. These areas included forecasting needs, food cost information needs, purchasing and the needs related to the production of food. The current practices used by the industry to meet these needs were discussed in Chapter IV. In this chapter a model planning and control system will be described. The model is designed to fill the current needs more fully than is being done under current practices.

Specifications of the Model

It would be ideal if all of the information needs of a food service firm could be handled in one integrated computerized planning and control system. Such a system would include all bookkeeping functions, production planning and record keeping, and a sophisticated purchasing/inventory control system. Such a system is possible. The proposed model, however, is designed as an interim step--one that from a financial and practical point of view can be immediately implemented in a medium-sized or larger (\$200,000 and up gross sales) food service operation. In other words, the overriding specification for the proposed

system is that it be capable of being installed in a restaurant currently in operation, requiring the minimum adaptive effort to accommodate the system.

System is time-sharing

Certain conditions had to be placed on the model in order to meet the goals of financial and practical feasibility. First of all, the system had to be designed as a time-sharing system. The purchase of complete computer installations, no matter how small or limited, is not financially feasible for the average medium-sized restaurant operation. Time-sharing operations have already been formed specifically to serve the food service industry.¹ They are currently working primarily with standard accounting information.² They do represent the future direction for the industry in terms of information needs.

A secondary specification concerning the time-sharing feature of the system is that it should be capable of operation on UMASS, the time-sharing capability currently available at the University of Massachusetts, Amherst, Massachusetts. This limitation is primarily one of convenience for the investigator although UMASS is quite representative of the better currently available time-sharing systems.

The system should be designed to operate from a

teletype or keyboard input. Although other input/output (I/O) equipment could be used, and may even be desirable, the keyboard is currently the most versatile as well as the least expensive I/O equipment currently on the market. Extensions concerning the use of more sophisticated equipment will be covered in Chapter VII.

Cost specifications

It is self-evident that any system of control should not be more costly than the expected loss the system is designed to avert. If a simple manual planning and control system can successfully keep costs within a desired range there is little advantage of going to more costly electronic data processing. Of course, the larger the operation the greater the need for control and the more the operator can afford to pay. The number of variables involved make the setting of a specific dollar amount quite difficult. For example, if the EDP equipment is used for other purposes than food planning and control, the effective cost is lowered.³ Obviously, some target is useful. For this reason the proposed model was designed to meet the following specifications:

- . Capable of being operated from one terminal.
- . One half hour of CDC 3600 equivalent C.P.U. time each month.
- . No more than 2 hours of operator's time per day.

At current charges this should mean that terminal rental, operator's time, and the time-sharing package (including software charges) would run about \$300.00/month.⁴ Again, some of these charges would be offset if other use were made of the terminal. This would represent about 1.8 percent of sales for a \$200.00 operation. It would be expected that the proposed system would save its cost by lowering expenditures on raw materials. As indicated, however, these figures should be considered only the roughest guide.

Forecasting specifications

In Chapter IV it was indicated that forecasting is based primarily upon an individual's interpretation of historical and assumptive data. The system should be capable of taking over a major part of this task, that of storing, locating, and using historical information. This would then provide a base upon which a forecaster could more accurately reach a final forecast. Such a base would tend to eliminate differences due to personalities of forecasters and would be particularly useful to those new to forecasting for a particular operation.

It should be possible to make the forecast with sufficient lead time to purchase necessary items. It should also be possible to forecast for variable time lengths

and to update forecasts as new information becomes available.

Forecasting covers.--The form of the forecasts should be in total transient covers expected for each meal and the number of each menu item expected to be sold.

It would appear to be infeasible to expect a formula approach to forecasting to handle all possible variables. For this reason the model will rely on added inputs and judgements from the individual making the forecast to "round out" the task. Known variables, such as banquets, and unknown variables, such as weather, will both be left to the forecaster.

Forecasting food use.--Once covers have been forecast the system should be capable of calculating the amount and cost of ingredients needed to meet the forecast. This information would provide the basic information necessary for planning purchasing. When the forecast is combined with inventory on hand a purchasing agent would be able to do an intelligent purchasing job in terms of amounts needed.

The periods for which food use would be determined should be variable and the model should have the capability of determining the amount of food needed for a given recipe item, a group of unrelated recipe items, a menu, or a group of menus. This would allow a food production manager to obtain the amount of ingredients to requisition

for specific items or menus if necessary.

Pre-costing menus.--In the discussion of the "Pre-control" system in Chapter IV it was indicated that the system advocated pre-costing menus on the basis of forecast covers. Two advantages to this pre-costing capability are: (1) the advantage of knowing in advance the expected volume/cost relationship for a given menu, and (2) the ability to test proposed menu mixes. The latter advantage makes it possible for the operation to test the effect of adding or subtracting various items; the first allows the operator to determine how much variance from desired variable margin is caused by shifts in the menu sales mix.

It would also be advantageous to calculate the actual cost of specific surrounding items (where possible) rather than utilize average cost as is recommended for the "Pre-Cost, Pre-Control" system.⁵ By doing so a more accurate picture of the cost/volume relationship can be obtained.

Specifications for food cost information

To be able to obtain the proper information to control the cost of raw materials we must be able to determine what the current costs are and whether or not they meet current standards or budget. The value of some kind of a cost system to accomplish this goal has been pointed out and the use of a potential cost system suggested.⁶ What has also been pointed out is that a potential cost system is extremely difficult to maintain manually, even when average

costs of groups of items served are used rather than the individual item costs.⁷

Ideally, then, the proposed system should be capable of calculating what the raw materials cost should be (standard or potential raw materials cost), what the cost actually was (raw materials cost), and compare the two.

The cost calculations should be made available on a daily basis, and the operator should be able to retrieve daily and to-date costs and comparisons. Costs as a percentage of sales should also be calculated and sales figures maintained on a daily and to-date basis.

Potential costs and sales.--The system should be capable of receiving figures for the number of covers actually sold and converting these figures into potential costs and sales. It should be able to provide period totals on these costs and sales. This should be done with a minimum of human input. In addition, the potential variable margin generated by each menu item should be calculated--as should totals when desired.

The system should be able to handle all items sold in a particular period. This would mean items not normally appearing on the regular menu. Banquets and non-menu a la carte items would appear in this category. The result would be a total of all potential costs, sales, and variable margins for a given period.

Actual costs and sales.--The system should be capable of calculating a daily estimated food cost such as the one described in Chapter IV.⁸ As a first step this should be the total cost of food sold in a given day. The system, however, should be so designed that it would also be possible to break this total cost down into food groupings in order that a more detailed cost analysis can be made.

The system should also be capable of receiving actual sales inputs and store this information for retrieval for daily reports, comparison with potential sales, or other possible statistical uses.

Cost analysis.--Finally, the system should be able to retrieve potential and actual cost information, calculate the variance between the two, and display this information for the use of management. This information should be available on a period or to-date basis.

Specification for inventory control

As a starting point, a minimum provision for inventory control should be provided by the system. Records of receipts, issues, and the inventory valuation should be maintained.

Receiving.--The system should be capable of recording daily receipts of food items and updating perpetual inventory balances of foods placed in storage.

Issuing.--Requisitions for food from storage should

result in the updating of perpetual inventory records and in records of issues for use in calculating the daily estimated food cost.

Inventory evaluation.--It should be possible to retrieve the value of storeroom inventories at any time. It should be possible to change or update perpetual inventories easily as new items are added or deleted or as prices change. It should also be possible to adjust recorded quantities on hand if these quantities do not agree with those determined by physical inventory.

There is a considerable amount of input necessary for inventory maintenance. For this reason the method of computing inventory changes should be as time saving as possible--considering that a keyboard-type input device is being used. Consideration should be given to the incorporation of other types of input devices at some future date.

Overall system specifications

In general, the system should make it easier for the food service operators to forecast the number of people he expects to serve, what they will eat, and the amount of the various ingredients needed to serve these numbers. It should allow him to obtain daily food cost information and to update and extend his inventory. It should provide checks against operator error. The

restaurant manager provided with accurate information should be able to plan and control more effectively.

Lastly, the system should be capable of being expanded to provide more and different kinds of information if desired. Very large operators might well need, and be able to afford, systems capability not provided in the basic system.

These, then, are the specifications of a planning and control systems model that will provide managers with useful information not now readily available. The next question is: how should such a system be designed? The next section describes the pattern by which the system was constructed. The implementation and testing of the system will be covered in Chapter VI.

The Design of the Systems Model

The design of the model can be considered in terms of system functions: input, process, and output. The model design can also be described in terms of the elements of the system. It is not always possible to avoid overlap, such as when certain systems elements serve both processing and output or processing and input functions. The elements of the system considered in the design state are data files and programs.

The system consists of ten computer programs (which include several subprograms), six categories of data files,

and the various source documents by which data are gathered for input to the computer. There is, of course, the human element that must be considered--primarily in relation to the construction of the source documents and the entering of information from them.

System files

The ingredient file contains the following information for each food item used:

1. Ingredient code.
2. Ingredient name.
3. Purchase price of the ingredient.
4. Unit on which the purchase price is based.
5. The unit by which each ingredient is inventoried or issued.
6. A conversion factor to convert units of purchase to units of issue.
7. Number of inventory units on hand.
8. Storeroom in which ingredient is located.

The ingredient code is a five-digit number. The first integer indicates to which one of nine primary food groups the item belongs. Within each of the nine primary groupings are ten subgroups. The last three digits form the number of the item, allowing for the possibility of 1000 items in each subgroup. Codes then may run from 1000 to 99999, with the numbers from 00000 to 09999 reserved for a special type of ingredient, called a subassembly, that

will be covered in the recipe file description. A listing of the primary and secondary group codes can be found in Appendix A. Although a food inventory, let alone a subgroup, may not contain a thousand items, the additional available codes allow for the addition of new items in alphabetical order. The primary groups are the same as those used by Balintfy in the CAMP system. (One expressed need has been for standardization of the numbering system for raw food ingredients.) An example of the information it is necessary to gather for each ingredient is shown in Figure 13.

Inq' Code	Ing. Name	Pur. Price	Pur. Unit	Conv. Factor	I/I Unit	On Hand	Store No.
60010	Milk, Homogenized	4.55	5 gal	5.0	Gal	10.0	3

Figure 13.--Ingredient file information.

The recipe file.--The recipe file contains all of the recipes used in the model. These recipes are of two types: (1) subassemblies and (2) recipes. Subassemblies are recipes that are not sold individually but always appear as part of another recipe. An example would be a gravy or other sauce. These subassemblies appear in the regular recipes as ingredients. A given recipe record contains two kinds of information, general information about the recipe

and information about each ingredient in the recipe. The general information includes the recipe code, recipe name, selling price, number of ingredients, number of portions, and the smallest number of portions it would be possible to make by dividing the recipe. The recipe ingredient information contains the ingredient code, ingredient name, and the amount of each ingredient used in the recipe expressed in inventory issue (I/I) units. An example of the general information (designated as a "Recipe Header") needed for the recipe for broiled live lobster is shown in Figure 14. The ingredient information for the same recipe is shown in Figure 15.

Recipe Code	Recipe Name	Selling Price	No. of Ingreds.	No. of Portions	Linear Divisor
25060	Br. Live Lobster	5.95	3	1	1

Figure 14.--Header information for lobster recipe.

Recipe Code	Ing. Code	Ingredient Name	Amount in I/I Units
25060	14020	Butter, Print	.1870
25060	23020	Lemons, Fresh	.2500
25060	58025	Lobster, Live/1-3/4 lb.	1.7500

Figure 15.--Ingredient information for lobster recipe.

The recipe is a five-digit code with the first digit representing the course of a meal in which a recipe is normally used, and the second digit the primary food grouping of the main recipe ingredient. A listing of the primary codes and the courses they represent is given in Appendix B.

It should be noted that the information in the recipe file is not intended for use by production personnel. The model design assumes that a recipe tub file is maintained for use by the cooks. These file cards have the recipe information in a form (tablespoons, cups) that can be readily understood by kitchen personnel. This differs from the CAMP system, in which menus are produced daily by the computer. The decision to deviate from the CAMP example was made to: (1) require less file space, (2) allow easier file updating and maintenance, and (3) avoid the necessity of daily recipe print-out. The primary advantage in the daily print-out, the ability to communicate recipe changes immediately to production personnel, does not accrue to the commercial feeding establishment as it would to the hospital food service.

The menu file.--The menu file contains all of the menus used in the model. Menus are distinguished both by the recipes appearing in the menu and the day of the week on which the menu is used. It is necessary that some form of cyclical menu pattern be used to satisfy the forecasting

algorithm used with the model. For the model a series of seven menus, presented consecutively in a six-day operation, creates forty-two day-menu combinations. The menu codes are two-digit codes with the first digit representing the day and the second a particular menu. Menu 36, for example, would be menu number 6 being used on day 3. It would follow from this that an operation with a never-changing menu (one form of a cyclical menu pattern) would have only six day-menu combinations in a six-day operation.

Like the recipe file, the menu file contains both generalized menu information and specific information about each recipe on the menu. The general (or header) information includes:

1. The menu code.
2. The date on which the menu last appeared.
3. The total number of covers sold on that date.
4. The total dollar sales for that date.
5. The exponentially smoothed average total covers.
6. The exponentially smoothed trend of total covers.
7. Forecast covers for next use (optional).
8. Number of menu items in the menu.

Besides the forty-two header records, an additional six records are maintained in the file to record sales totals for each of the six days of operation. These records are then used in the forecasting procedure described in the next section.

In addition to the headers, the following information is maintained for each menu item (recipe) that appears on a menu:

1. Recipe code.
2. Recipe name.
3. Number of recipe covers sold on header date.
4. Exponentially smoothed average sales of the recipe expressed as a ratio to total covers.
5. Exponentially smoothed trend of the recipe ratio.

The information that must be collected for the menu file are the menu and recipe codes, the recipe names, and the original number of recipes or menu items. All other information is entered or updated on a regular basis through an input program. It would be possible, however, to visualize the information carried in the header and recipe sections of the menu file appearing as in the samples in Figure 16 and Figure 17, respectively.

Menu Code	Date Last Used	Total Covers	Dollar Sales	Ave. Sales	Trend	Forecast Covers	Number of Recipes
36	11/23/70	150	843.00	157.51	-0.763	157	12

Figure 16.--Representation of menu header record.

Menu Code	Recipe Code	Recipe Name	Last Covers	Avg.	Trend
36	12060	Minted Fruit Cup	62	.48	.030
36	14020	Celery/Bleu Cheese	41	.17	.011
36	25150	Tenderloin Tips	44	.31	.030
36	25160	Broiled Lamb Chops	80	.21	.010
36	25170	Chix A La Maryland	29	.46	.044
36	38010	Tossed Green Salad	90	.71	.057
36	38040	Au Gratin Potatoes	77	.65	.043
36	46060	Creme de Menthe Parfait	40	.36	.020
36	49110	Apricot Pie	56	.25	.017
36	59000	Coffee	87	.68	.052
36	59100	Milk/Glass	41	.17	.009
36	63000	Rolls & Butter	119	.82	.057

Figure 17.--Representation of recipes record for menu 36.

Three other files: non-menu (BANQUET), forecast covers (FORCAST), and a summary sales and cost history (COST) are utilized in the model.

The banquet file.--Not all restaurant food sales are made from the daily menu. Banquet sales and a la carte sales of items not on the regular menu (such as leftovers sold by means of clip-ons) must also be accounted for. The sales of these items are entered into the banquet

file daily, or as often as such sales take place. Entries are recipes, grouped by date. All recipes sold on the same banquet are further identified by an alphabetic or alpha-numeric code. Number of sales, selling price, and total item dollar sales are stored in addition to the date, recipe code, and recipe name. An example of the file data is shown in Figure 18. Note that this particular example includes one banquet (for Taite) and one a la carte other sales item (Lemon Chiffon Pie).

Date	Rec. Code	Recipe Name	Banq. Code	No. of Port. Sold	Sell- ing Price	Total Sales
12/31/70	12070	Pears/Prosc. Ham	Taite	35	0	0
12/31/70	25070	Pr. Ribs of Beef	Taite	35	6.00	210.00
12/31/70	38010	Tossed Green Salad	Taite	35	0	0
12/31/70	38050	Fr. Fried Potatoes	Taite	35	0	0
12/31/70	46130	Strawberry Parfait	Taite	35	0	0
12/31/70	59000	Coffee	Taite	35	0	0
12/31/70	63000	Rolls & Butter	Taite	35	0	0
12/31/70	49070	Lemon Chiffon Pie		10	.50	5.00

Figure 18.--Sample banquet file data.

Note that, in this instance, only the total price of the banquet is retained with the entree. If more than one entree is sold that price can be retained. That the Lemon

Chiffon Pie is an a la carte other item is indicated by the absence of a banquet code.

Contents of the banquet file are printed out daily and retained as hard copy. The banquet file can then be cleared to cut down on disk storage costs.

The forecast file.--The forecast file is used to accept the menu forecasts as they are made. Total and recipe cover forecasts are written into this file for later use in the pre-costing and food use programs. The file has the same format as the menu file with these exceptions: (1) the name of the weekday on which the menu will appear is substituted for the date, and (2) only the forecast covers are retained--all other information is zeroed out. For a sample of this format see Figures 16 and 17. Like the date in the banquet file, the contents of the forecast file are only temporary and can be cleared after they are utilized.

The cost file.--Total dollar sales, total issues, total food direct, net transfers, and total potential costs are recorded in the cost file. These figures are entered into the file daily by other programs and are used to calculate and display cost information. This information is designed to be maintained as long as is needed with a year's out considered to be the usual time span. An example of a single day's cost file data is shown in Figure 19.

Date	Total Sales	Total Issues	Food Direct	Net Transfers	Total Potential Cost
12/31/70	819.05	150.00	60.00	-20.00	182.04

Figure 19.--Sample cost file data.

Systems programs

The systems programs are designed to: (1) input data to the files, (2) utilize file data in the calculations required by the system, (3) write the results of the calculations into files, and (4) print out various information as "hard" data. One program, an executive program, only calls other programs.

The executive program.--The executive program (EXERCPRO) is a calling program that allows the user to call the particular program he wishes to use. Control is returned to the executive after the program called completes execution. The relationship between EXECPRO and the other nine main programs is illustrated in Figure 20.

Intermittent input programs.--The intermittent tasks of initializing, changing, and displaying data in the FOODS, RECIPES, and BANQUET files are handled by the three file maintenance programs INGPRO (ingredients or inventory), RECPRO (recipes), and MENPRO (menus). These programs enable the user to add and delete whole or parts of records and

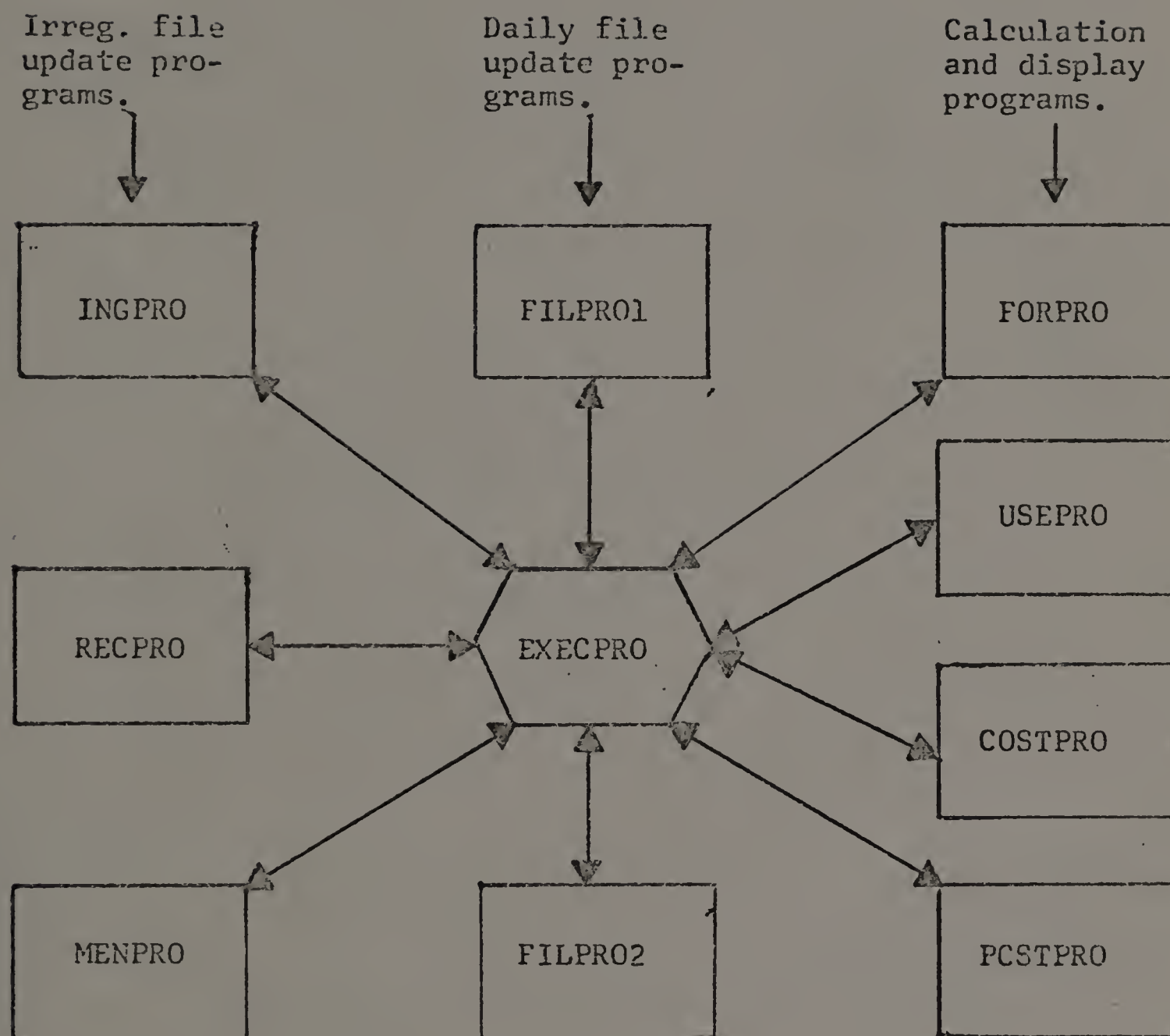


Figure 20.--Relationship between executive control program (EXECPRO) and other main system programs.

display the contents of the three files. They are used apart from the regular daily input/output operations.

An outline of the scheduling and functions of the three programs discussed above is presented in Figures 21, 22, and 23. In each of these figures the files used by the program are indicated by arrows from the small boxes above the "Program" box. Arrows emanating from the "Program" box to the small boxes below indicate that information is being written into the designated files. Keyboard input and outputs are shown at the left and right of the "Program" box.

Note that INGPRO, RECPRO, and EXECPRO are entirely devoted to file maintenance. It is necessary that they be sufficiently flexible for the user to be able to make any desired change to the three files on which they operate. The operator may choose any combination of inputs, depending on the data he wishes to affect.

Two programs are designed to allow the regular inputting of daily sales and cost figures. These programs, FILPRO1 and FILPRO2, would normally be run on a daily basis with their primary tasks being to update the files with the figures from the previous day's operation. They would be run before any of the data retrieval programs. Although these programs are intended to be run daily, it would be possible to let data accumulate for several days before input--as long as retrieval, too, was delayed.

Program: . . . Ingredient file program (INGPRO).

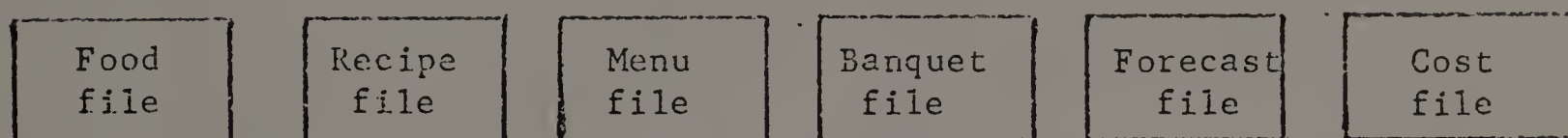
Previous step: None required.

When used: . . . Irregularly.

Objective: . . . Provide irregular updating for ingredient file.

Next step: . . . Recipe file updating (optional).

File inputs



Non-file inputs:

Ingredient code.
Ingredient name.
Purchase price.
Unit of purchase.
Conversion factor.
Inventory/issue unit.
Amount on hand.
Storeroom location.

Program

1. Adds ingredients to FOODS file.
2. Deletes ingredients from FOODS file.
3. Replaces ingredients in FOODS file.
4. Updates file information.
5. Displays file information.

Non-file outputs:

Ingredient display.

Food
file

Recipe
file

Menu
file

Banquet
file

Forecast
file

Cost
file

File outputs

Figure 21.--Scheduling, inputs, and outputs of ingredient file program (INGPRO).

Program: . . . Recipe file update (RECPRO).

Previous step: All recipe ingredients must be in FOODS file.

When used: . . . Irregularly.

Objective: . . . Provide irregular updating for recipe file.

Next step: . . . Menu file updating (optional).

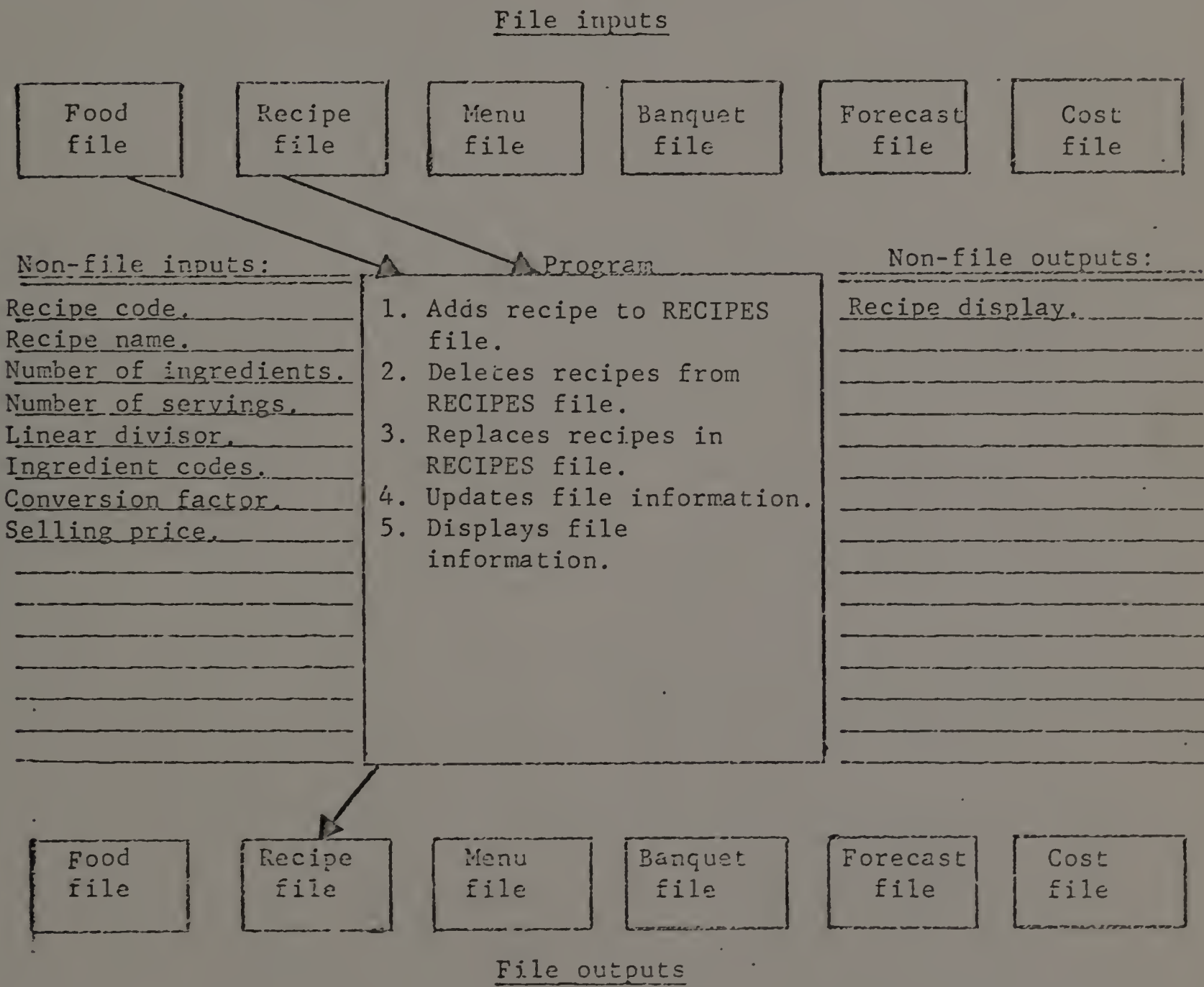


Figure 22.--Scheduling, inputs, and outputs of the recipe file update program (RECPRO).

Program: . . . Menu file update (MENPRO).

Previous step: All menu recipes must be in RECIPES file.

When used: . . . Irregularly.

Objective: . . . Provide irregular updating for menu file.

Next step: . . . Use of MENUS file data.

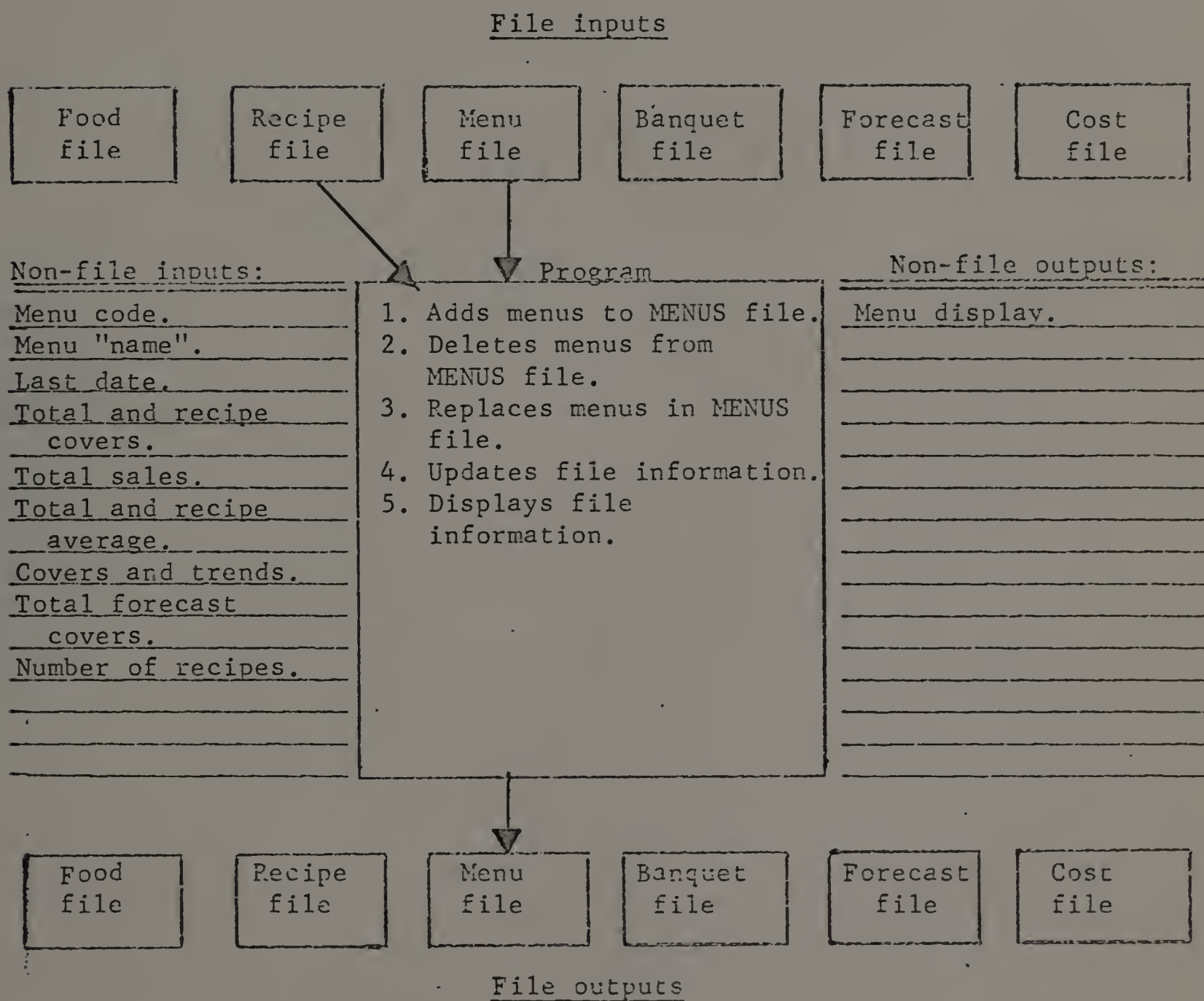


Figure 23.--Scheduling, inputs, and outputs of menu file update program (MENPRO).

Sales inputs.--The program FILPRO1 (see Figure 24) is the vehicle for inputting daily sales figures. The total number of menu covers sold, the number of each menu item sold, and any banquet or a la carte other sales are recorded through this program. The sales data must be retrieved by the cashier or checker and summarized for use by the system operator. This information would be taken directly from sales checks, duplicate sales checks or a digital counter maintained by the checker. For larger operations additional data collection equipment could prove useful. This type of equipment is discussed in Chapter VII under "Extensions."

FILPRO1 also provides for the updating of total menu and recipe cover averages and trends. This results in these figures always reflecting the latest sales data.

Cost inputs.--Cost inputs are handled by the program FILPRO2 (see Figure 25). Storeroom purchases are entered into the FOODS file from the receiving record or invoices along with current purchase prices. Requisitions from storage are deducted from FOODS and are extended and totaled. The total value of food that has been sent directly by to the kitchen for immediate use is entered. If any additions or deductions from food issued or sent directly to the kitchen (such as transfers to other departments, steward's sales, or employee's meals) have occurred they are entered as "Transfers." (For purposes of the model it is assumed

Program: . . . Daily sales update (FILPRO1).

Previous step: MENUS file must be current.

When used: . . . Daily.

Objective. . . To input sales information and update averages and trends.

Next step: . . . Forecasting, cost calculations.

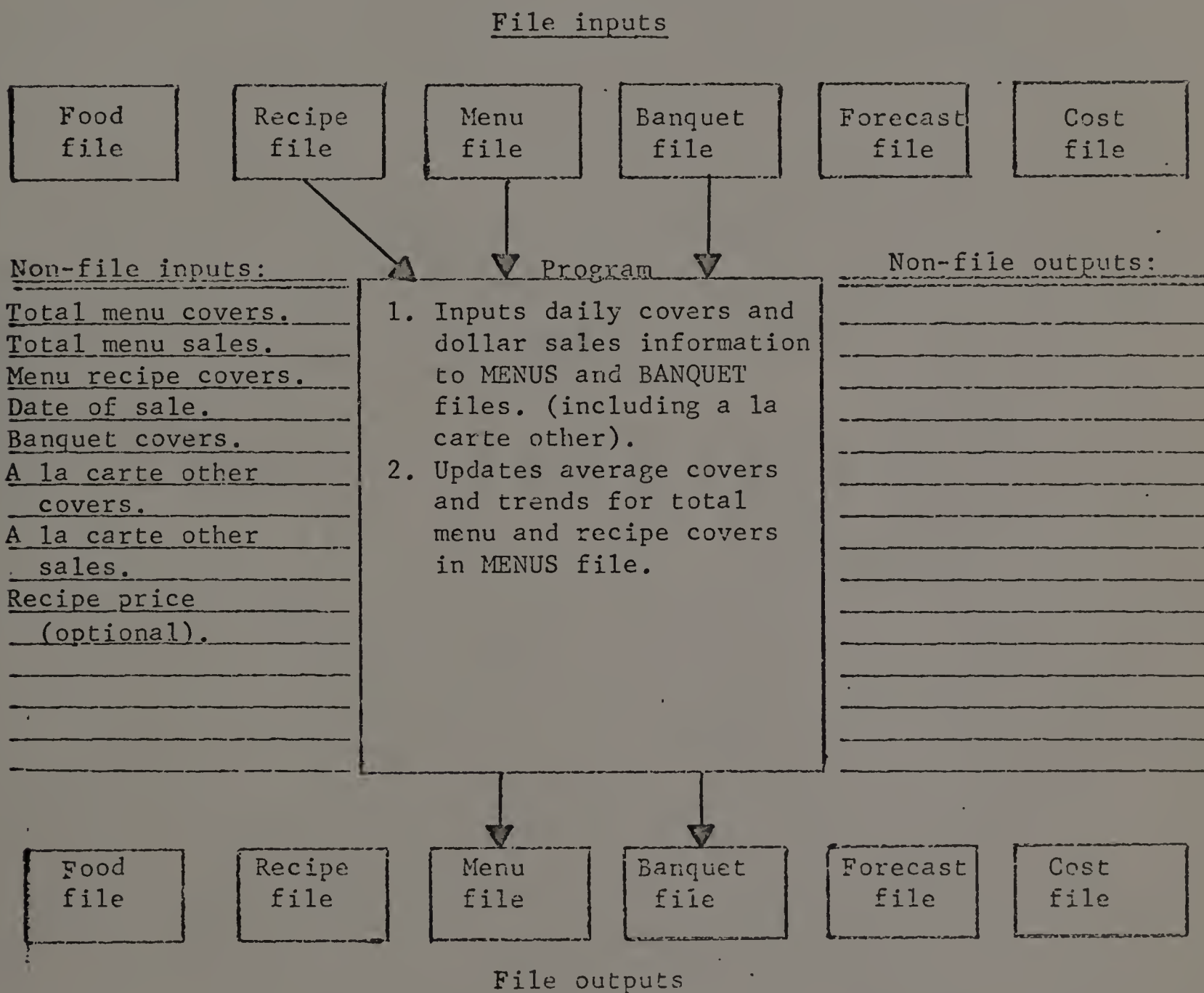


Figure 24.--Scheduling, inputs, and outputs of daily sales update program (FILPRO1).

Program: . . . Daily cost update (FILPRO2).

Previous step: FOODS file must be current.

When used: . . . Daily.

Objective: . . . Input purchase and issue data.

Next step: . . . Cost calculations.

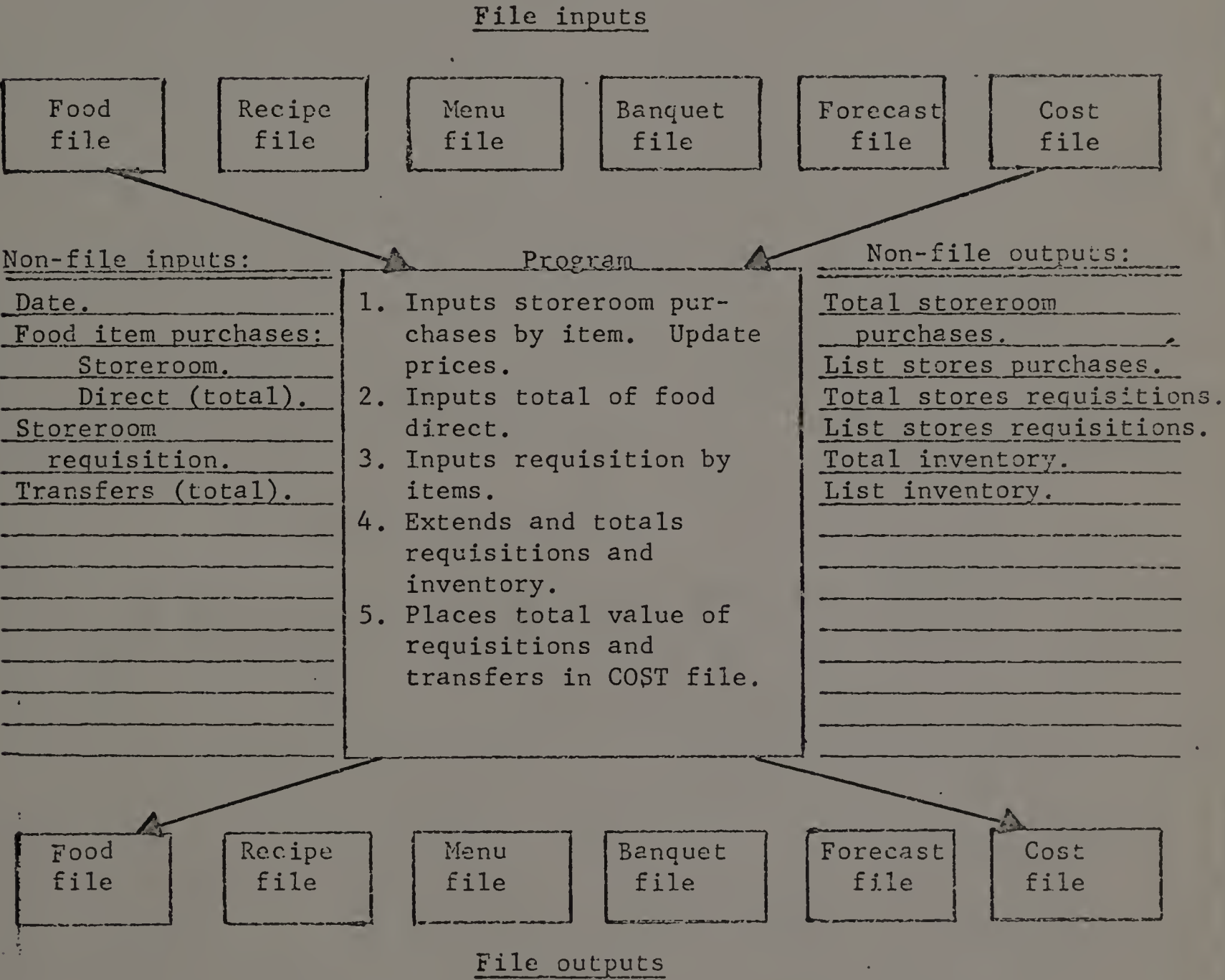


Figure 25.--Scheduling, inputs, and outputs of daily cost update program (FILPRO2).

that only interdepartmental transfers need be considered.)

Two important options available with FILPRO2 are:

(1) the ability to display and total daily issues and storeroom purchases, and (2) extend and display the current inventory.

As can be seen in Figure 25, FILPRO2 writes new prices and updates on-hand amounts in the inventory (FOODS) file and writes the totals of issues, food direct, and transfers into the cost (COST) file.

Calculation and retrieval programs fall into two categories. The first category contains programs PCSTPRO and COSTPRO. These programs are illustrated in Figures 26 and 27, respectively, and are intended for daily use.

Potential and pre-cost program.--Program PCSTPRO (Figure 26) calculates the potential cost and sales of each item sold and extends and totals these sales and costs for each menu, banquet, or a la carte recipe sold. Potential cost differs from that described in Chapter IV in that the cost of all recipes sold is calculated, not just the value of the entree with an estimate for surrounding items. This definition of the term potential cost will hold when referred to in connection with the model. The difference between potential sales and potential cost, or potential variable margin, is also calculated.

As an option, PCSTPRO will also accept forecast figures from the forecast file (FORCAST) and calculate

Program: . . . Potential and pre-cost program (PCOSTPRO).

Previous step: All file update programs completed.

When used: . . Potential-daily. Pre-cost-any time.

Objective: . . To calculate and list recipe cost information.

Next step: . . Calculating actual cost.

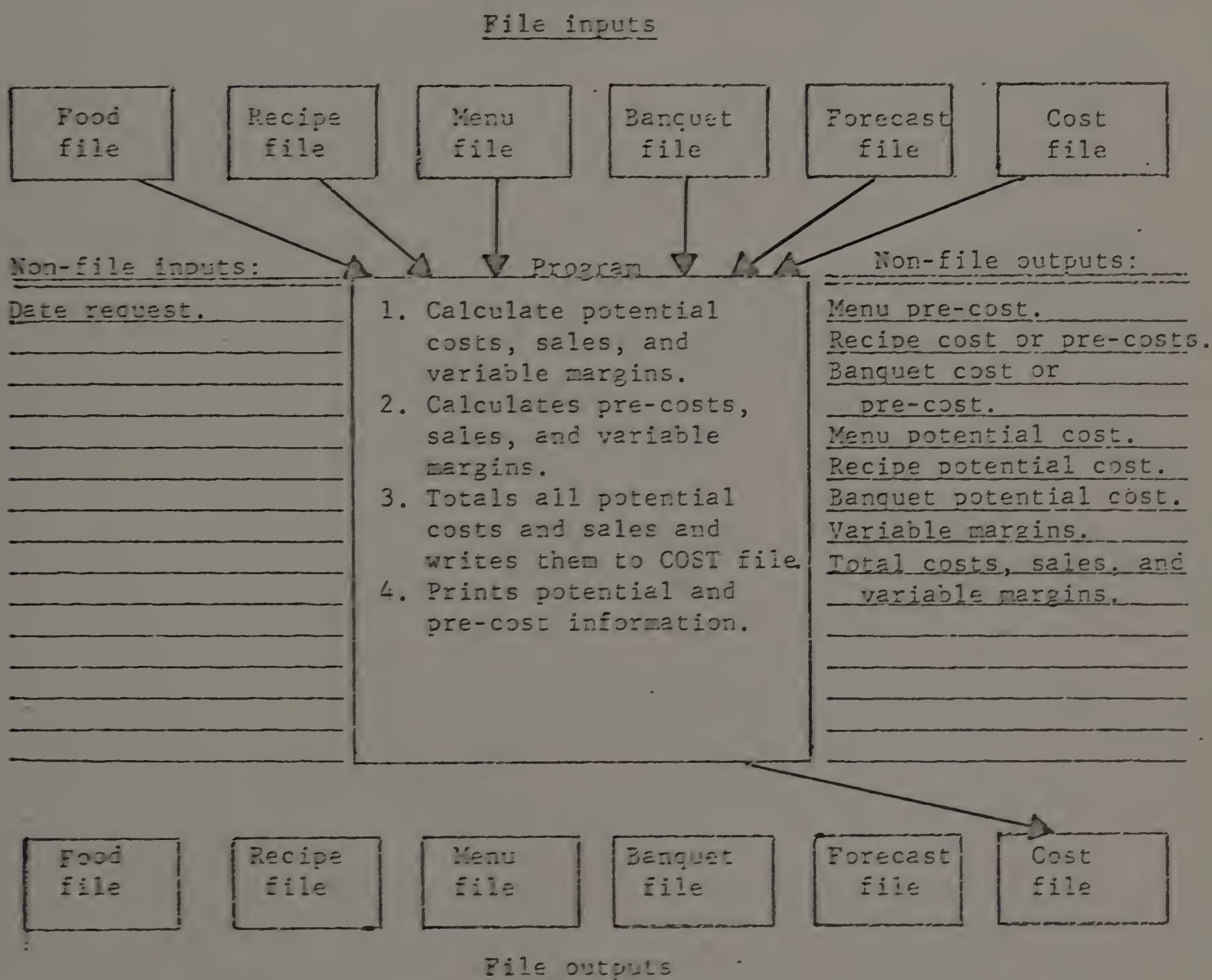


Figure 26.--Scheduling, inputs, and outputs of the potential and pre-cost program (PCOSTPRO).

sales, costs, and variable margin based on forecasts.

Potential or pre-costs, sales, and variable margins can be displayed and written into files for further use. Potential costs and sales would normally be written into the cost file (COST) for further use in the daily costing program.

The cost program.--The cost program (COSTPRO) is designed to calculate and display daily and to-date potential and actual costs and sales, and to display them for management use. This program is illustrated in Figure 27.

The two remaining elements of the system, the forecasting and food use programs, are designed for use when needed. Both can be used daily or at longer intervals.

The forecasting program.--The forecasting program (FORPRO) is designed to utilize the average and trend information in MENUS to forecast total menu and menu recipe sales. The program should be sufficiently flexible so that any menu or combination of menus can be selected. Normally, however, the program use is expected on a weekly basis with forecasting being carried out for the following week. This provides a lead time of seven days, normally quite sufficient for obtaining food items. See Figure 28 for the description of FORPRO.

The food use program.--Program USEPRO (see Figure 29), the food use program, can be used with either actual or

Program: . . . Cost calculation and display program (COSTPRO).

Previous step: Cost file updated through FILPRO2 and PCOSTPRO.

When used: . . . Daily, or anytime cost information needed.

Objective: . . . To provide actual and potential cost information.

Next step: . . None within model.

File inputs

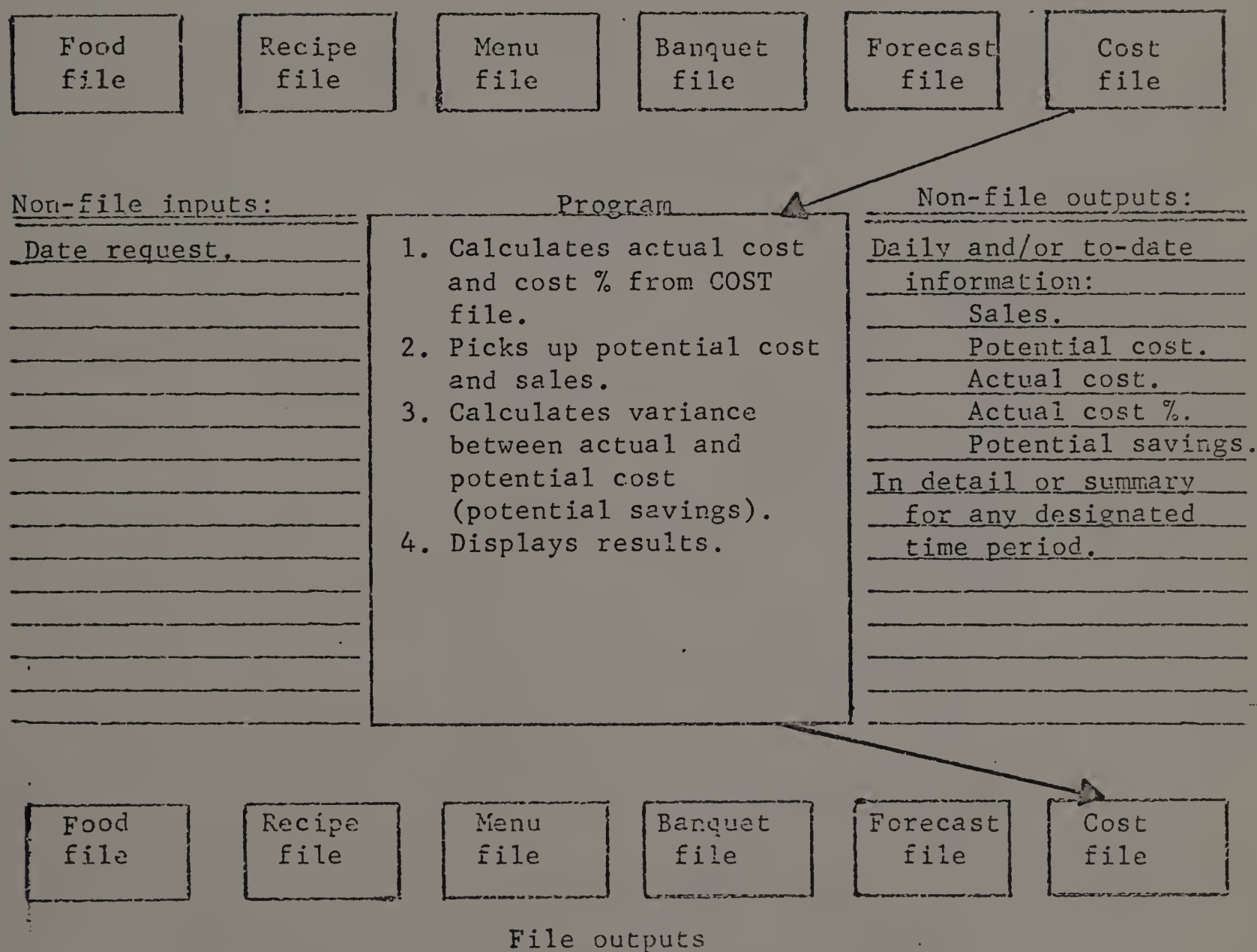


Figure 27.--Scheduling, inputs, and outputs of the cost calculation and display program (COSTPRO).

forecast covers. When used with actual covers sold it calculates and displays what the amount and value of each ingredient used should have been. When used with forecast figures it calculates the amount of ingredients needed to produce the forecast covers, along with the value of these ingredients at current prices.

This systems design meets the specification outlined in the first part of this chapter. It can be adapted by food service managers with little disruption of their current operation. The model provides needed food cost information with minimal human inputs and at an acceptable estimated cost. The specific workings of the model, along with actual output of the system will be described and shown in the following chapter.

FOOTNOTES

¹"The State of Information Processing in the Hotel-Motel Industry," pp. 4, 8.

²Ibid.

³Ibid.

⁴This figure would be in addition to current expenditures on food cost information.

⁵Brodner, Carlson, and Maschal, pp. 388-389.

⁶Above, p. 116.

⁷Above, pp. 116, 118.

⁸Above, pp. 106-112.

C H A P T E R V I

CONSTRUCTING AND TESTING THE MODEL

An integrated system, by definition, implies a number of interdependent elements. This interdependency makes it difficult to present a system description without redundancy. In an attempt to overcome this difficulty, the system is divided into the following functional elements in this section:

1. Data collection.
2. File construction and maintenance.
3. Forecasting.
4. Food cost determination.

Data Collection

The data used in the model were not intended to portray any particular food service operation. The intent was to create a model that was sufficiently complex to be believable, but not so large as to cause unnecessary effort which, in the final analysis, would not add to effectiveness of the system.

Menu data

An operation serving one menu per day is assumed in the model. The seven menus used in the model each have

the following structure:

1. Two appetizers.
2. Three entrees.
3. Tossed green salad with choice of dressing.
4. A potato.
5. Two desserts.
6. Two beverages (milk or coffee).
7. Rolls and butter.

An attempt was made to follow accepted menu-making practices in the areas of flavor, consistency, form, and color. Otherwise, the menus are quite balanced in their presentation of items, with no "specialty house" tendencies.

The cyclical character of the menu pattern was pointed out in the last chapter. It is important that a given combination of items be considered "different" if it appears on two different days of the week. Menu 37, for example, is not considered the same as menu 47, even though the same items are on each menu. Different statistics for use in forecasting can then be maintained to reflect the impact of different days of the week on the sales mix of a particular menu. The forty-two day menu combinations are shown in Appendix C, the listing of the menu file.

The sales data in the menu file, except for the total dollar figure, was generated in the forecast simulation

which will be described in a later section. The total dollar figure is simply a place holder and is meaningless. It would normally be generated by the potential cost program (PCSTPRO). The averages and trends, both total and recipe, along with total and recipe covers were generated as the last forty-two days of a simulated year and have been entered with dates running from 11/13/70 to 12/31/70 (skipping every seventh day).

Recipe data

The recipes that appear in the seven menus were gathered from a number of sources, mostly standard recipe books. It would have been easier to design recipes to fit the system, but this would have violated the concept that the system must be able to handle recipes currently being used in a given operation. The number of ingredients in a recipe, and the number of portions the recipe was designed to prepare, were established by the recipe chosen.

Each recipe was then analyzed to determine the smallest number of portions that could be produced by simple linear division of the recipe. This figure was designated the "linear divisor." The selling price was then assigned to each recipe, based on current area prices. Subassemblies and certain recipes (such as salad) carry no selling price because they are included in the price of another dish or the meal. (If a salad is purchased separately, it can be

priced by the a la carte "other" feature in the cost input program.)

The conversion factor for each recipe ingredient was calculated on the basis of the inventory/issue unit of that ingredient. For example, a recipe calling for eight ounces of chicken base, issued in one pound jars, would show a conversion factor of .5000 for that item. The conversion of cups, quarts, teaspoons, tablespoons, and the like is a time-consuming task. Fortunately, it has to be done only once. This method was chosen over the use of conversion tables because of the difficulty in providing tables for all possible conversions, and because less machine time would be needed than with the tables.

The file listing for all of the recipes used in the model is provided in Appendix D. Note that all recipes with code numbers less than 10,000 are subassemblies.

Ingredient data

The entire ingredient file is shown in Appendix E. The ingredient data were taken from invoices received at the University of Massachusetts Student Union in the spring of 1969. The number of units on hand for each ingredient is an arbitrary figure. The ingredient conversion factor is a number which, when divided into the unit of purchase, will give the inventory/issue unit.

This allows items to be entered into the system in the units by which they are invoiced.

The storeroom codes represent the various storages as follows:

1. Dry storage.
2. Meat refrigerator.
3. Dairy refrigerator.
4. Fruit and vegetable refrigerator.
5. Freezer.
6. Kitchen.

The collection of data for the menu, recipe, and ingredient files is necessarily the first step in the construction of the model. The next section will treat the manner in which these data are entered into the system.

FOOTNOTES

File Construction and Updating

Two types of file formats are available on the UMASS time sharing system. Files held in BCD (binary coded decimal) format can be fetched and listed by the user through the use of simple systems commands. Binary files, on the other hand, can be written and read only through other programs. The binary format has several advantages over BCD, including the ability to read and write unformatted data and to allow pointer settings any place in the file. Still, the BCD format was chosen

because of the ease of checking file content, deemed necessary in the experimental situation.

Files are stored on disks in the UMASS system, and formatted BCD data are read from, or written to the following: terminal, active storage, and files from the disk under format control. It is possible to assign eight files to eight different units, but only three of these units can be opened at any one time. The process of opening and closing files is relatively expensive in terms of CPU (computer central processing unit) time. The fewer files used in any one program, the greater advantage in terms of cost to the user. Files are opened and closed in each program by subroutine OPENUP, described in Figure 30.

The names used in any program are input by the user. This feature allows several files of the same type, e.g., menu files, to be maintained. Multiple operations can then be operated from the same set of programs.

The system requires two general types of file updating, intermittent and daily. These are handled by two different sets of programs and can be discussed most easily in separate sections.

Intermittent file updating

The ingredient and menu files are normally updated daily, but may also require intermittent updating. The

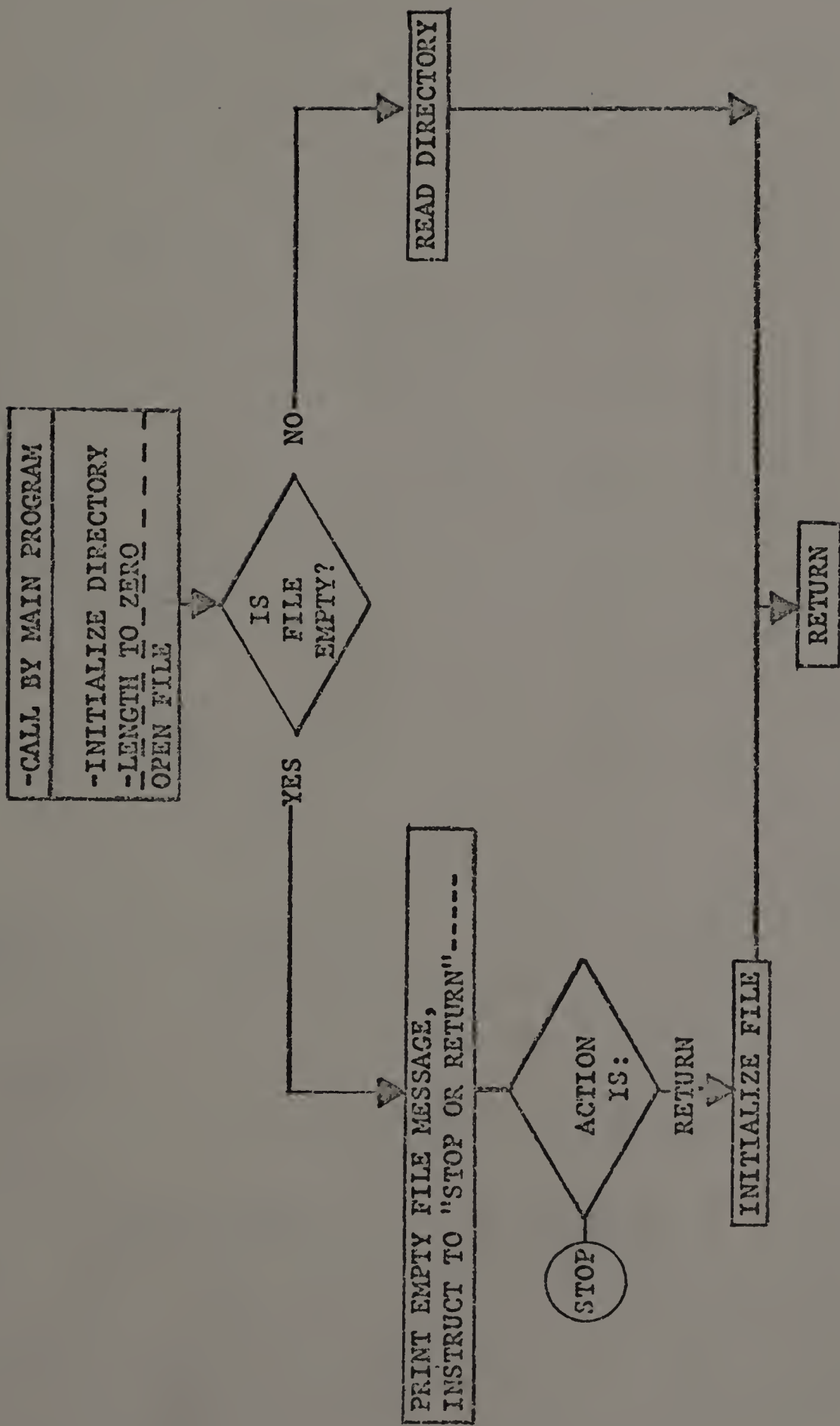


Figure 30.--Descriptive flow diagram of subroutine OPENUP, a file-opening subroutine for all main programs.

recipe file is changed only at regular intervals. A group of three programs perform the non-daily changes. These three programs, INGPRO, RECPRO, and MENPRO must be used to initialize the ingredient, recipe, and menu files, respectively. The program logic is similar for the three programs. A description of program INGPRO is shown through the medium of Figure 31. (This "program description" style of flow chart will be used throughout this chapter.) Programs RECPRO and MENPRO differ from INGPRO primarily in the use of "headers" for each recipe or menu. These headers identify the start of each recipe or menu in the file and contain the necessary EOF (end of file) information to let the program know when it has finished with one complete unit.

When the files are first initialized, the ingredient file is written first. The recipe file is then written and, as codes are entered for new ingredients, a check is made on the ingredient file to determine whether or not the ingredient is in the file. If it is, the name of the ingredient is printed out to inform the operator visually the name of the item coded. The operator must then respond before the input process can continue. Figure 32 shows the dialogue that takes place when a recipe for potatoes au gratin is added to the file. A similar dialogue takes place when the menu file is being updated--with the recipe rather than the ingredient file being checked for matching codes. A

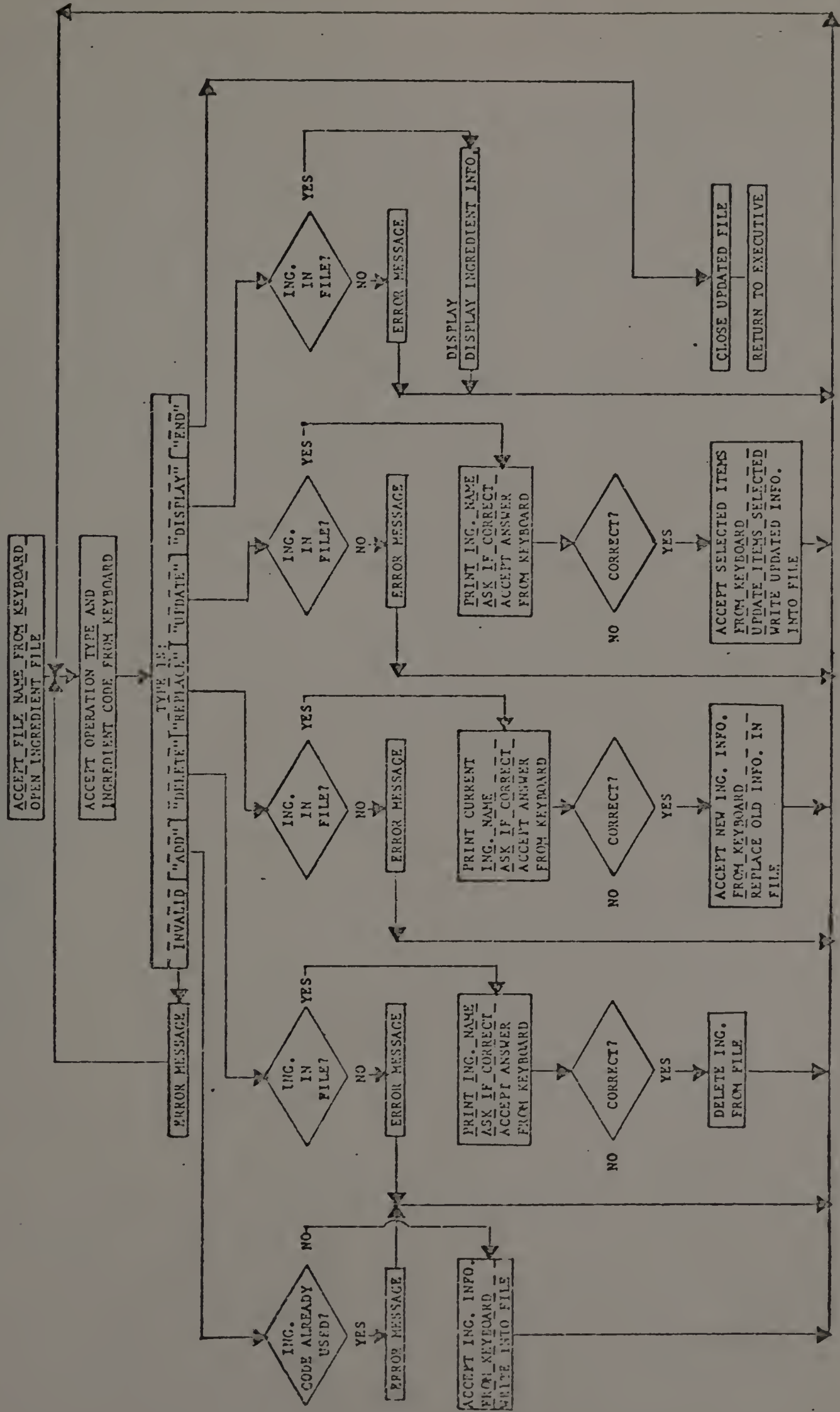


Figure 31.--Descriptive flow diagram of program INGPRO, a file updating program.

RUN RECPRO

16K

RECP. FILE NAME ?RECIPES

ING. FILE NAME ?FOODS

OPERATION AND CODE ?ADD 38040

NEW RECP. NAME ?POTATO AU GRATIN

SELL-PRICE, NO. ING., NO. SERV., AND LIN. DIV

? .30 5 48 12

ING. CODE AND CONV.

?110 1.5

NAME IS CHEESE SAUCE/QTS CORRECT ?YES

ING. CODE AND CONV.

?14020 .125

NAME IS BUTTER/PRINT CORRECT ?YES

ING. CODE AND CONV.

?30010 .125

NAME IS BREAD CRUMBS CORRECT ?YES

ING. CODE AND CONV.

?82050 15.

NAME IS POTATOES/MAINE CORRECT ?YES

ING. CODE AND CONV.

?95150 .0312

NAME IS PAPRIKA CORRECT ?YES

OPERATION AND CODE ?DISPLAY 38040

38040 .30 POTATO AU GRATIN 5 48 12

38040	110	CHEESE SAUCE/QTS	1.5000
38040	14020	BUTTER/PRINT	.1250
38040	30010	BREAD CRUMBS	.1250
38040	82050	POTATOES/MAINE	15.0000
38040	95150	PAPRIKA	.0312

OPERATION AND CODE ?END RUN

Figure 32.--Adding and displaying a recipe through the use of program RECPRO.

search subprogram, used by all of the main programs, locates the item in the file being used or indicates that the item is not in the file. A description of this subprogram (SEARCH) is shown in Figure 33.

The flexibility of programs INGPRO, RECPRO, and MENPRO is such that almost any kind of file change can be initialized by one of the three programs. If an ingredient is added to a recipe, the header is automatically updated to reflect the change. If a menu item is dropped, the number of menu items shown on the header is automatically decreased by one. Another time-saving feature is that only the figure, or figures, the operator wishes to change must be typed in at the terminal. For all others the "X" key is struck, indicating "no change."

The display option allows the operator to check quickly on any item in the file. Figure 32 also shows the display of the recipe for potatoes au gratin.

The program options, "add," "delete," "replace," "update," and "display," are included in each of the three programs, INGPRO, RECPRO, and MENPRO. The "add" option allows a new ingredient, recipe, or menu to be added. "Delete" allows a current item to be dropped. After each of these options are exercised the file directories are sorted into numerical order according to their codes and the new information is merged into the file. The "replace" option provides for replacement of every bit of information

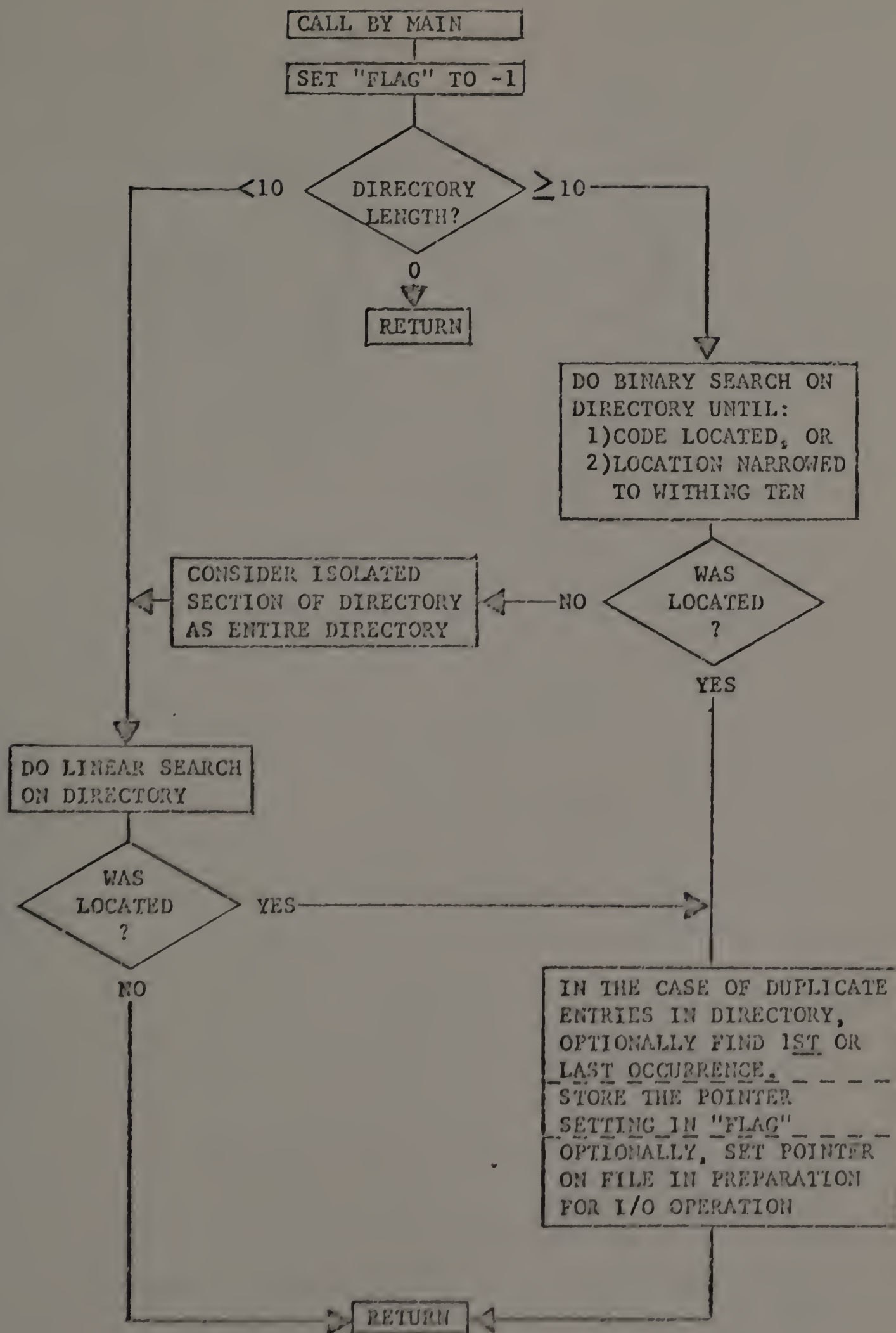


Figure 33.--Descriptive flow diagram of subroutine SEARCH, a search routine used by all main programs.

carried about an item except the code. The "update" option allows data to be changed, but not the item name or code. RECPRO and MENPRO allow either the header or the body of the record to be changed independently. The display option was described in the preceeding paragraph.

Daily file updating

The system was designed to accommodate the daily entry of certain sales and cost data. Although it is not necessary to input this information physically each day, it must be entered in daily segments.

Sales information is entered through the use of program FILPRO1. As indicated in Figure 34, this information can relate either to one of the forty-two day/menu combinations or any recipe in the recipe file. The normal procedure would be to enter the number of covers pertinent to the menu of the previous day, and then input banquet and a la carte "other" information. This information would be taken from a marked menu or other collecting device. The optional banquet code allows all recipes served on a particular banquet to be grouped together. The current recipe selling price can be used for these recipes, or an optional value can be entered. This makes it possible for one price to be set for an entire banquet, if so desired. The menu data are written into the menu file and the banquet and a la carte "other" data into a

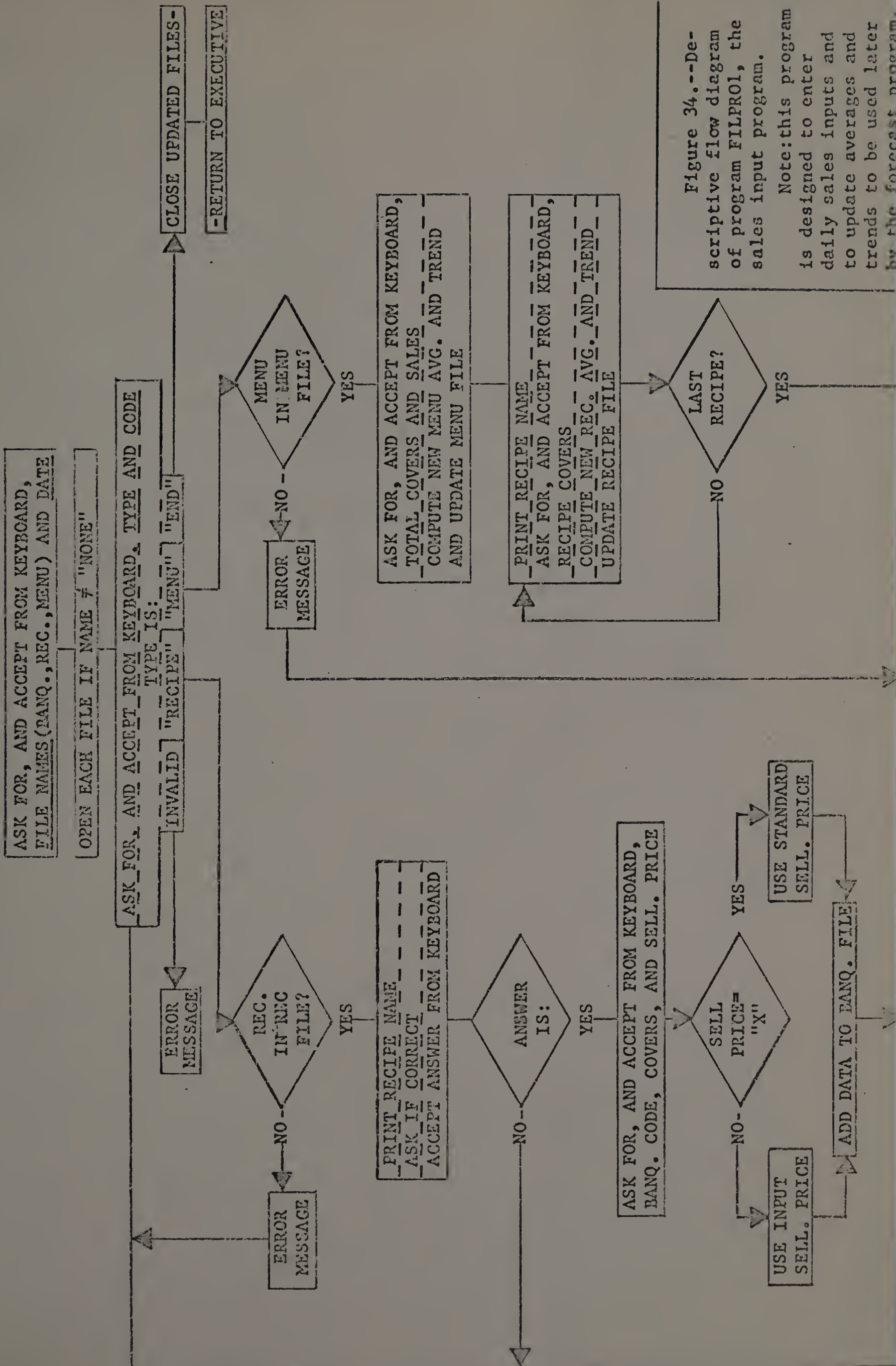


Figure 34.--Descriptive flow diagram of program FILPRO1, the sales input program.

Note: this program is designed to enter daily sales inputs and to update averages and trends to be used later by the forecast program.

banquet file. A typical daily input cycle for FILPRO1 can be found in Appendix F. An example of a banquet file, resulting from this input, can be seen in Appendix G.

FILPRO1 updates the total and recipe averages and trends to reflect the import of the daily inputs. The formulas used to update these figures are given in the section on forecasting under "Testing the forecasting algorithm."¹

Cost information enters the system through FILPRO2, described in Figure 35. Costs and amounts of ingredients are taken from invoices or the receiving clerk's daily record and entered--either by individual ingredient for those foods that are placed in storage, or as a total of those goods sent directly to the kitchen for use that day. The amounts of issues from storage are then entered and automatically priced and extended. The price used is the most recent price. (This price is also used in the calculation of potential cost so that comparisons are not affected by price differences.) This method of entering and pricing requisitions leaves only the amount of issue units to be certified by a storeroom clerk. He does not need to maintain prices in the storeroom.

Transfers to or from cost of food sold are entered through FILPRO2. The totals of issues (requisitions), food sent directly to the kitchen (food direct), and

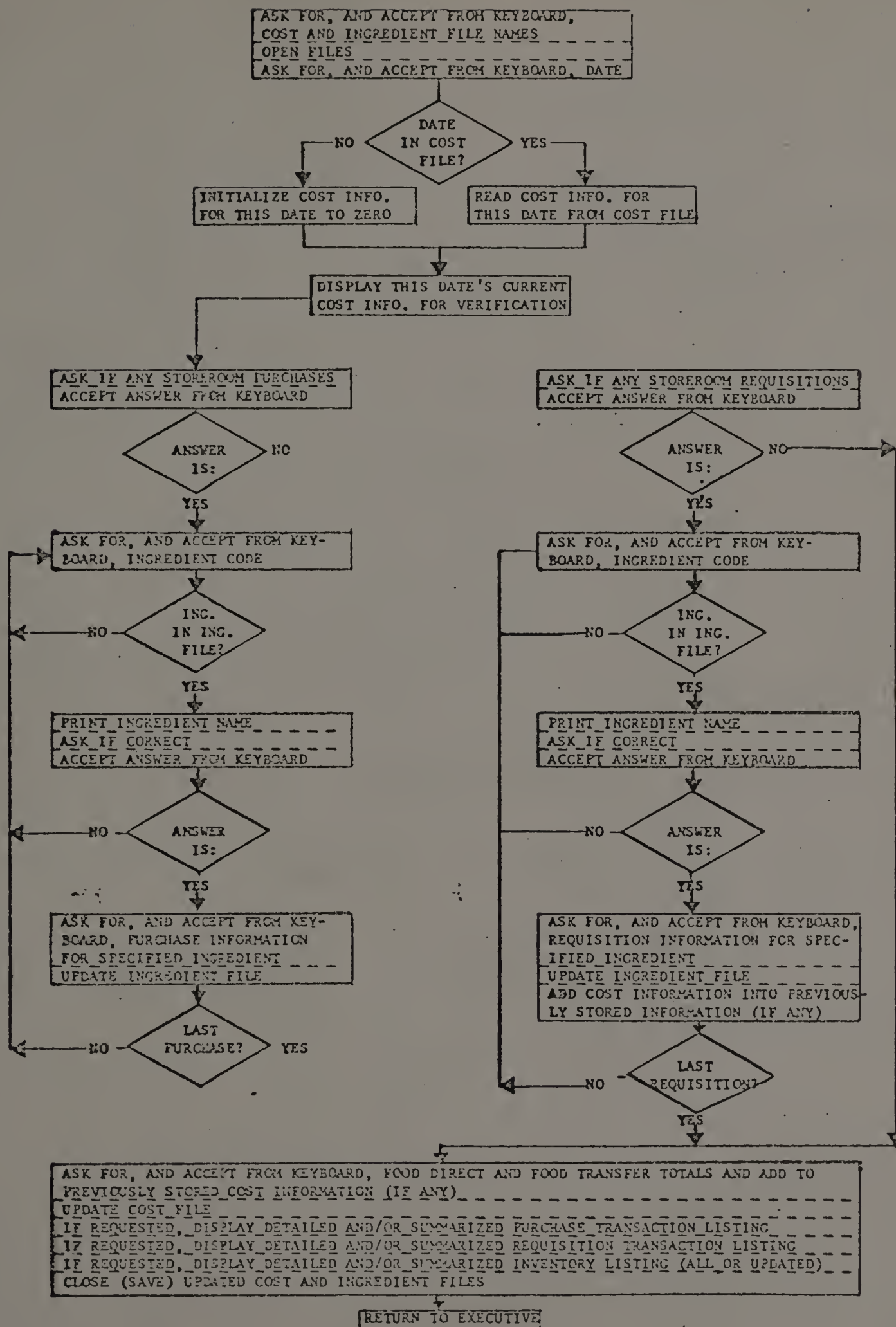


Figure 35.--Descriptive flow diagram of program FILPRO2, the cost input program.

transfers (food from other departments) are then written into the cost file. These three figures are then combined later in order to determine the estimated cost of food sold for the day by program COSTPRO.²

Program FILPRO2, at the option of the user, can then cause to be printed out an itemized list of storeroom purchases, or issues, or both. The user also has the option to list those inventory listings affected either by purchase or issue, to show the new amounts of goods on hand. Lastly, the user may ask that the entire inventory be extended, totaled, and printed out, either in detail or in summary. A sample day's input for FILPRO2 is shown in Appendix H.

Other file updating

There is one other file used in the model. This is the forecast file, used only as a temporary storage for forecast data. Its use will be covered in the following section.

Forecasting

It was pointed out in Chapter IV that formula approaches to the forecasting of covers expected in food service operations were not used by the industry. In an attempt to find a workable method, an investigation was made into the use of exponential smoothing for restaurant forecasting. A

description of this investigation follows.

Testing the forecasting algorithm³

It should be recalled that forecasting the expected demand for a public food service operation is complicated by the number of variables involved, the interdependency of these variables, and the number of unique demand functions displayed by the nation's restaurants. Remember, too, that only a base demand is sought--the forecaster is expected to coordinate predictive variables such as weather and special events.

Data for the model used to test the algorithm were not available and had to be generated. Three typical demand situations were simulated: (1) increasing cycle, (2) increasing ramp, and (3) increasing ramp with a step function. The general method used was to generate a total demand curve and then generate a demand for the menu items (recipe demand), based on total demand.

Two total demand generating programs were used. (The Fortran version of all programs used in the test can be found in Appendix I.) The first demand was used to generate cyclical or ramp demand data. Up to ten points can be entered (six were used in the model). Solutions of the equations were achieved through matrix inversion, and a smoothed curve through these points was used as a base for a random generation of demand points, using a uniform

distribution. The generator will handle any number of days up to 365, and the parameters of the distribution can be changed for each point. The results of the demand generation can be written on binary files, printed, or plotted graphically by the computer.

The second total demand generator (STEPS) will take either a cycle or a ramp and create a step in the curve of any amount and at any point or points. It will also write on binary files, print, or plot (as a percentage) the demand function it generates. Only the ramp with step was used in the test.

Recipe demand was generated by two programs--BRDMND or BRDMNDN. These programs made use of a seed file (BANK) which gave the average popularity of each recipe item as a percentage of total demand. BRDMND utilized a uniform distribution with a range of plus or minus .05, and BRDMNDN a normal distribution with one standard deviation about the mean of .05, to generate demands randomly around the means furnished in BANK.

Program FORSIM contained the forecasting algorithm for the model. Total forecast demand was calculated using exponential smoothing.⁴ First a new average demand was calculated using the formula: New Average Demand (FAVG) = $\text{Alpha} (\text{Total Demand [I]} - \text{Old Average}) + \text{Old Average}$.⁵ The current trend was then determined: Current Trend = New Average - Old Average. The New Trend then equaled:

Alpha (Current Trend - Old Trend) + Old Trend. The forecast for day $I+6$ was then made using: Total Forecast ($I+6$) = New Average + $(1 - \text{Alpha}) / \text{Alpha}$ x New Trend. Averages and trends were calculated and stored for each day of the week so that, for example, Monday's figures were used in forecasting the demand for the following Monday.

Recipe forecast demand was calculated using the same formula approach. Trends and averages, however, were calculated for each day/menu/recipe combination. (Remember that these trends and averages are carried as a ratio to total demand.) For example, an average and a trend were maintained for a shrimp cocktail when it appeared on Menu 1 on a Monday. This avoided the problem of cross elasticity between menu items and the varying popularity of certain menu items on a certain day.

Demand for each type of curve was generated for two years, with 312 days of operation each year. Averages and trends were calculated as of the end of the first year and were then used as a starting point to track the second year's demand. The plots of these demand functions for both years, for the three tested curve shapes, are shown in Appendix J.

The statistical program COMPARE was used to test the accuracy of the algorithm and to determine the best constants to use for each of the three demand functions.

The statistical program was designed to calculate:

1. The standard deviation (SDEV) of the difference between demand and forecast.
2. The coefficient of variation (SDEV mean of the demand).
3. The square of the forecast errors.
4. Total of the absolute forecast errors.
5. Sum of the demand.
6. Average of the demand.

The square of the forecast errors was chosen over total absolute error as the governing criterion on the basis that large errors on particular days would cause more problems for the restaurateur than smaller absolute error over time.

Selected results of the simulation are given in Appendix K. In general, the model produced acceptable results within the limitations described in the following section.

The algorithm tracked the ramp demand more closely than the cycle or step demands. The coefficient of variation was .022 ($\text{Alpha} = .07$) indicating (if normal distribution of the forecast errors is assumed) that approximately two-thirds of the time the standard deviation of the error would be less than 2.2 percent of the demand. The coefficient of variation of the recipe errors was .1527 ($\text{Alpha} = .1$) using the normal generator. The high recipe was number 9 with .2487 and the low was

number 12 with .1032.

The algorithm tracked the cycle demand with a coefficient of variation of total forecast error of .0274 (Alpha = .37). Recipe errors, using the uniform generator, had a coefficient of variation of .0933. Recipe 9 was high with .1695, and recipe 12 low with .0563.

The step demand was run with one step of 20 (about 15 percent increase) on the 156th day. The result for total forecast error was a coefficient of variation of .0318 (Alpha = .09) (using the normal generator) with recipes 9 and 12 high and low, respectively, at .2486 and .1044.

The conclusion drawn from the test was that exponential smoothing appears to provide a useful method of formula forecasting when cycle menus are used. Certain recommended changes seem appropriate before this method is used in an actual operation.

The primary change would be to use a tracking signal to indicate needed changes in the smoothing constant. When the standard deviation of the error became too large, it would cause a change in the smoothing constant to diminish the error. Because the success of the algorithm with individual recipes fluctuated with the size of the demand it would also be advisable to provide different alpha factors for individual recipes or groups of recipes.

Both of the above changes should improve the accuracy

of the recipe forecasts. Even without these changes, the average accuracy would seem to be well within the useful range.

Making the forecast

The actual forecast for the food cost information system model is accomplished through program FORPRO, described in Figure 36. The normal procedure would be for a forecast to be generated at least one week in advance of the target date in order to provide sufficient lead time for purchasing.

The forecaster simply indicates the code of the first menu in the forecast and the number of menus he wishes included. He must recognize, however, that the farther he forecasts into the future, the less accurate his forecasts will be, because the averages used will become more and more out of date. For example, if a forecast is made on a Monday for the six days beginning a week from the forecast date, the averages and trends used for the total covers would have been calculated two weeks before the actual date of forecast. If a two-week advanced forecast is desired, the averages would have been calculated three weeks in the past. Of course, there is nothing to prevent daily updating of forecasts as new information is added to the files.

The forecast(s) are written into a forecast file for

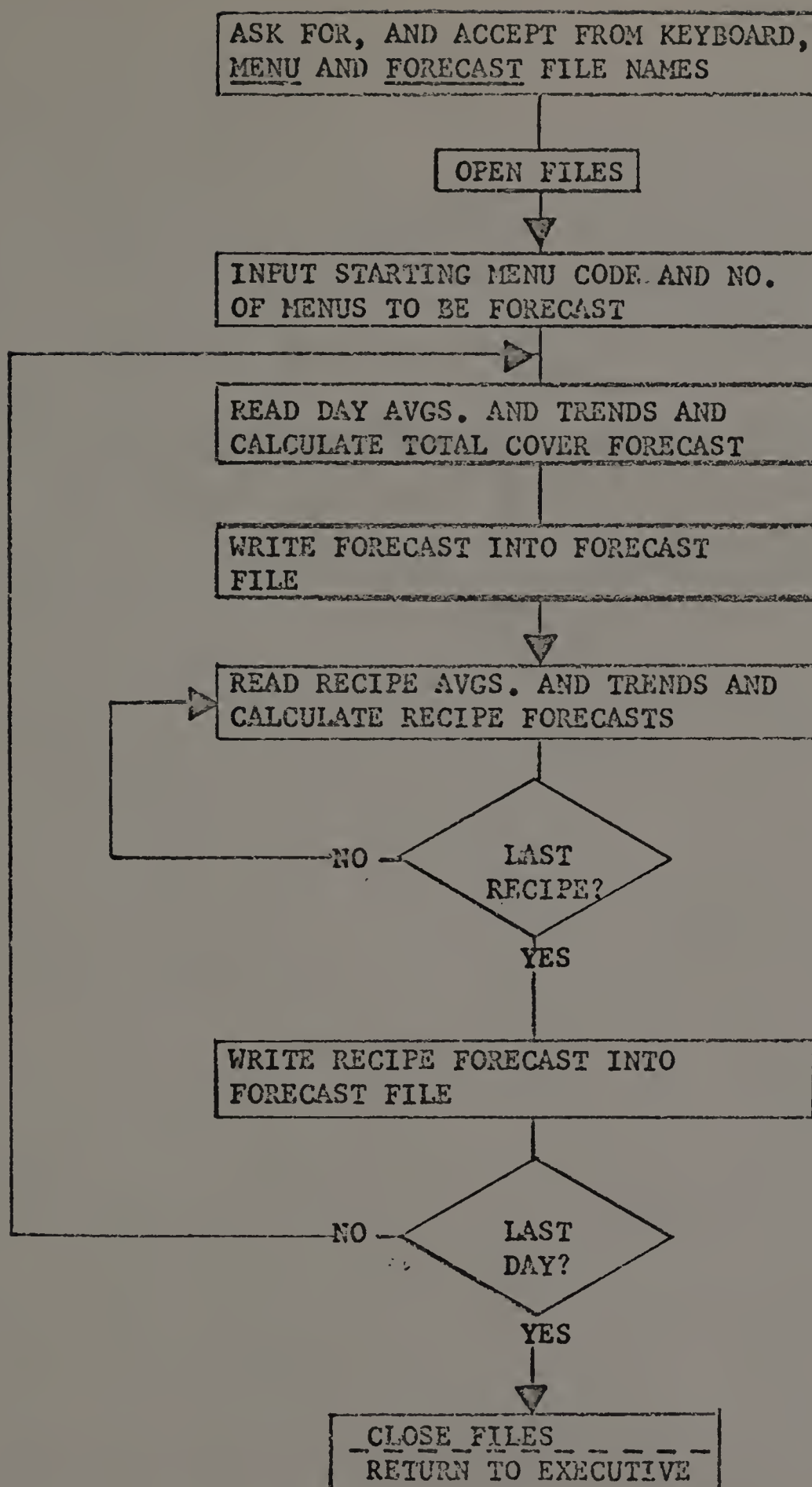


Figure 36.--Descriptive flow diagram of program FORPRO, a program designed to forecast total and recipe covers.

use in pre-costing and food use calculations by program FORPRO. A sample of the file information for a forecast for two menus, numbers 36 and 47, for the Monday January 11, 1971, and Tuesday January 12, 1971 is shown in Figure 37. It could be assumed that this forecast was made a full week before the intended date of sale, and was based on total averages and trends calculated after sales information had been entered for December 28 and 29, 1970. The recipe averages and trends would be those as of the last appearance of menus 36 and 47. Note that the file is formatted like the menu file, but with unnecessary information zeroed out. This allows the food use (USEPRO) and pre-cost/potential cost (PCSTPRO) programs to operate either on the menu file (historical data) or the forecast file (forecast data).

The food use program

After a forecast has been made, it is possible to calculate the amount of ingredients needed, and their cost at current prices, through program USEPRO. This program, described in Figure 38, will calculate the amount of food items needed for as many menus, single recipes, or a combination of both the user may wish to enter. For example, the exact amount of foods needed for the two menus forecasted (Figure 37) are generated by USEPRO and displayed in Figure 39. If banquets had been scheduled for

EXECUTE FORPRO

16K

MENU AND UTILITY FILE NAMES ?MENUS FORCST

MENU START AND NO. OF DAYS ?37 2

PROGRAM NAME ?EXIT

TIME: 0.427 SEC.

2	26								
37	MONDAY	0	142	0	0	0	0	0	12
37	12040	CRANBERRY SHRUB	49	0	0	0	0	0	
37	15010	BLUEPOINTS/H SHL	58	0	0	0	0	0	
37	25120	SWEDISH STEAK	37	0	0	0	0	0	
37	25130	BA STUFF SHRIMP	84	0	0	0	0	0	
37	25140	CHIX POT PIE	34	0	0	0	0	0	
37	38010	TOSSED GR SALAD	92	0	0	0	0	0	
37	38030	HASH BR POTATO	73	0	0	0	0	0	
37	42010	CHOC PARFAIT	28	0	0	0	0	0	
37	49090	BLUEBERRY TART	47	0	0	0	0	0	
37	59000	COFFEE	83	0	0	0	0	0	
37	59100	MILK/GLASS	34	0	0	0	0	0	
37	63000	ROLLS BUTTER	121	0	0	0	0	0	
41	TUESD.	0	142	0	0	0	0	0	12
41	12080	TOMATO JUICE CT	38	0	0	0	0	0	
41	15090	SHRIMP COCKTAIL	46	0	0	0	0	0	
41	25180	FILET MIGNON	75	0	0	0	0	0	
41	25190	BEEF POT PIE	33	0	0	0	0	0	
41	25200	HALF BR. CHIX	44	0	0	0	0	0	
41	38010	TOSSED GR SALAD	97	0	0	0	0	0	
41	38050	FR. FRIED POT.	95	0	0	0	0	0	
41	46130	STRAWBY PARFAIT	25	0	0	0	0	0	
41	49120	APPLE PIE	25	0	0	0	0	0	
41	59000	COFFEE	82	S	0	0	0	0	
41	59100	MILK/GLASS	38	0	0	0	0	0	
41	63000	ROLLS BUTTER	98	0	0	0	0	0	
37	3	41	107						

Figure 37--Instructions given to run program FORPRO and to forecast menus 37 and 41 for 1/11/71 and for 1/12/71.

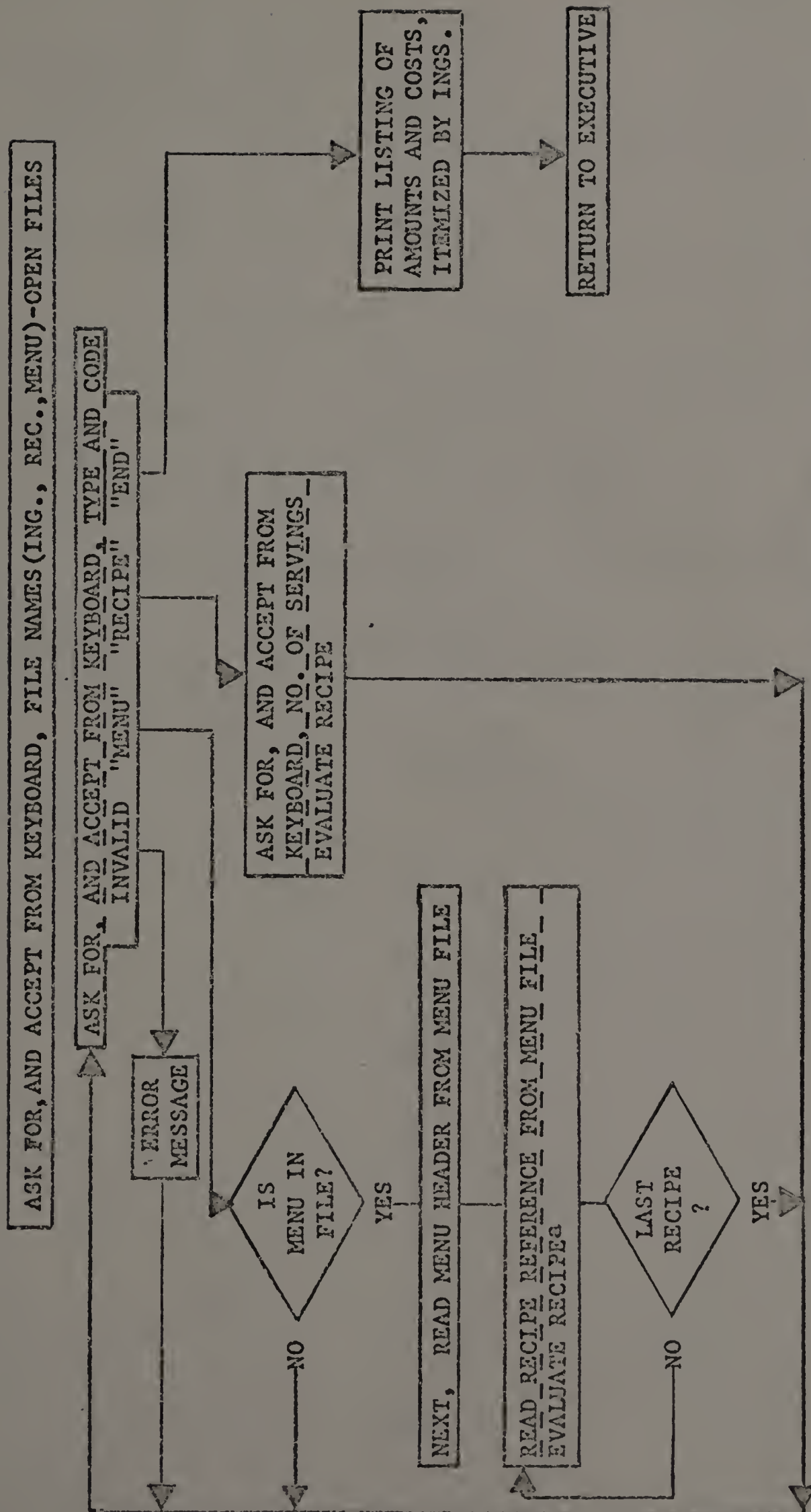


Figure 38.--Descriptive flow chart of program USEPRO, the food use calculation program.

^aRecipes, both individual and grouped, are evaluated similarly to the method used in program PCSTPRO (Figures 41 and 42). The major difference is that individual ingredient amounts and costs are stored for printing.

these two days, it would have been possible to enter the number of servings of each item to be sold on the banquets through the "recipe" option and have these amounts added to the list. By inputting only those items needed for a banquet, the total cost of the banquet alone can be quickly calculated as an aid in setting the selling price of the affair.

Forecasts and the number of portions it is possible to make with a given recipe do not always agree. For example, a forecast of 65 covers for a recipe geared to 48 portions poses a problem. This is partially solved through the use of the linear divisor and the rounding option in USEPRO.

Referring to the example in the previous paragraph, let it be assumed that 12 is the linear divisor for the recipe in question. This means that the recipe can be divided by quarters and that it is possible to make 60 or 72 portions of the recipe. A decision rule (in this case to round up if the forecast figure is half or more of the difference between possible batch sizes) then would round the 65 forecast to 60 and use that figure to calculate food use. The rounded output of USEPRO, comparable to that shown in Figure 39, is shown in Figure 40.

USEPRO can also be used with historical data from the menu file to calculate the exact amount of each ingredient that should have been used to produce a given

ING	NAME	AMNT	UNITS	COST
10010	SHORTENING/HYD	3.03	LB	.82
12010	OIL/OLIVE	.39	QT	.33
12020	OIL/SALAD	3.01	QT	1.51
14010	BUTTER/CHIP	6.10	LB/5	18.29
14020	BUTTER/PRINT	17.53	LB	9.13
20010	CHERRIES/BLACK	.16	C10	.22
21010	CRANBERRY JUICE	1.52	GAL	1.71
23010	LEMONS/FR	52.95	EA	2.05
31010	ROLLS/BRSRV	36.50	DOZ	14.60
33010	FLOUR/BREAD	6.23	LB.	.62
35010	CRACKERS/RITZ	27.60	LB	12.42
50010	BEEF/BOTTOM RND	11.69	LB	13.44
50020	BEEF/FILET	46.88	LB	79.69
50040	BEEF/SIR STP/8	18.50	LB	28.67
55010	EGGS/FRESH WHOLE	.74	DOZ	.44
56005	CHIX/FOWL	19.38	LB	8.72
56010	CHIX/FRYER/2.5	22.00	LB	8.80
58030	OYSTERS/BLPTS	2.32	PECK	4.64
58040	SCALLOPS	5.29	LB	5.56
58050	SHRIMP/FROZ/5LB	28.30	LB	43.86
60010	MILK/HOMOG	9.95	GAL	9.06
61040	CREAM/WHIPPING	1.08	QT	.81
62010	ICE CREAM/VANILL	1.64	GAL	2.79
63010	SHERBET/LIME	.78	GAL	.67
64020	CHEESE/BLEU	.31	LB/5	2.75
64040	CHEESE/CREAM	.79	LB	.67
70010	SUGAR/GRAN	1.53	LB	.17
73010	BLUEBERRY FILLIN	.42	C10	.73
73030	STRAWBERRY TOPNG	.32	C10	.73
76010	CHOCOLATE SAUCE	.36	C10	.36
80010	CARROTS/SLICED	2.28	C10	2.51
80030	CARROTS/WHOLE	.69	C10	.69
80050	MUSHROOMS/CAPS	.10	C10	.36
80090	ONIONS/PEARL	1.13	C10	1.74
80110	PEAS/GREEN	.07	C10	.06
80150	POTATOES/PARISN	1.13	C10	2.26
80170	TOMATO JUICE/460	4.94	C5C	1.93
80190	TOMATO PUREE	.07	C10	.07
81010	CARROTS/FRESH	.17	LB	.04
81030	CELERY/FRESH	11.90	LB	.98
81050	CUKES	9.45	LB	2.69
81070	HORSERADISH/FR	.60	GAL	1.21
81090	LETTUCE/ICEBERG	28.22	LB	4.23
81130	ONIONS/FRESH	7.24	LB	.36
81150	PARSLEY/FRESH	.04	BNCH	.01
81170	PEPPERS/GREEN	3.15	LB	.50
81190	RADISHES	5.77	BNCH	.46
82030	POTATOES/FRF/FRZ	4.75	LB/5	2.85
82050	POTATOES/MAINE	21.29	LB	.85
83010	PEAS/FROZ.	1.72	LB	.58
90010	BEEF BASE	.07	LB	.17
90020	CHIX BASE	.40	LB	.90
91010	COFFEE	10.31	LB	9.24
92010	TOBASCO	.00	EA.	.00
92920	WORCESTR SC	.37	GAL	.53
93010	PIE/APPLE	4.15	EA.	3.94
93100	TART SHELLS	3.90	DOZ	5.53
95010	BAYLEAF	.02	LB	.02
95030	CATSUP	.60	C10	.60
95050	CHILI SAUCE	.45	C10	.49
95150	PAPRIKA	.32	LB	.43
95170	PEPPER/BLACK	.06	LB	.06
95230	SALT	.52	LB	.16
95250	THYME	.04	LB	.03
95260	VANILLA	.07	PT	.21
95270	VINEGAR/WHITE	.28	GAL	.17
95290	WHOLE CLOVES	.02	LB	.03
97010	CORNSTARCH	.31	LB	.06
97100	WATER	8.29	XX	0

187

Figure 39.--
Output of food use
program (USEPRO),
not rounded.

321.23

ING	NAME	AMNT	UNITS	COST
<hr/>				
10010	SHORTENING/HYD	3.18	LB	.86
12010	OIL/OLIVE	.40	QT	.34
12020	OIL/SALAD	3.05	QT	1.53
14010	BUTTER/CHIP	6.01	LB/5	18.04
14020	BUTTER/PRINT	17.53	LB	9.13
20010	CHERRIES/BLACK	.16	C10	.22
21010	CRANBERRY JUICE	1.52	GAL	1.71
23010	LEMONS/FR	52.95	EA	2.05
31010	ROLLS/BRSRV	36.00	DOZ	14.40
33010	FLOUR/BREAD	6.51	LB.	.65
35010	CRACKERS/RITZ	27.60	LB	12.42
50010	BEEF/BOTTOM RND	12.75	LB	14.66
50020	BEEF/FILET	46.88	LB	79.69
50040	BEEF/SIR STP/8	18.50	LB	28.67
55010	EGGS/FRESH WHOLE	.74	DOZ	.44
56005	CHIX/FOWL	19.38	LB	8.72
56010	CHIX/FRYER/2.5	22.00	LB	8.80
58030	OYSTERS/BLPTS	2.32	PECK	4.64
58040	SCALLOPS	5.29	LB	5.56
58050	SHRIMP/FROZ/5LB	28.30	LB	43.86
60010	MILK/HOMO	9.95	GAL	9.06
61040	CREAM/WHIPPING	1.08	QT	.81
62010	ICE CREAM/VANILL	1.64	GAL	2.79
63010	SHERBET/LINE	.78	GAL	.67
64020	CHEESE/BLEU	.32	LB/5	2.80
64040	CHEESE/CREAM	.80	LB	.68
70010	SUGAR/GRAN	1.54	LB	.17
73010	BLUEBERRY FILLIN	.42	C10	.73
73030	STRAWBERRY TOPNG	.32	C10	.73
76010	CHOCOLATE SAUCE	.36	C10	.36
80010	CARROTS/SLICED	2.28	C10	2.51
80030	CARROTS/WHOLE	.75	C10	.75
80050	MUSHROOMS/CAPS	.10	C10	.36
80090	ONIONS/PEARL	1.19	C10	1.84
80110	PEAS/GREEN	.07	C10	.06
80150	POTATOES/PARISH	1.19	C10	2.38
80170	TOMATO JUICE/460	4.94	C5C	1.93
80190	TOMATO PUREE	.08	C10	.08
81010	CARROTS/FRESH	.19	LB	.05
81030	CELERY/FRESH	12.09	LB	.99
81050	CUKES	9.60	LB	2.74
81070	HORSERADISH/FR	.60	GAL	1.21
81090	LETTUCE/ICEBERG	28.60	LB	4.29
81130	ONIONS/FRESH	7.26	LB	.36
81150	PARSLEY/FRESH	.05	BNCH	.01
81170	PEPPERS/GREEN	3.20	LB	.51
81190	RADISHES	5.87	BNCH	.47
82030	POTATOES/FRF/FRZ	4.80	LB/5	2.88
82050	POTATOES/MAINE	21.00	LB	.84
83010	PEAS/FROZ.	1.88	LB	.64
90010	BEEF BASE	.08	LB	.18
90020	CHIX BASE	.40	LB	.90
91010	COFFEE	10.00	LB	8.96
92010	TOBASCO	.00	EA.	.00
92920	WORCESTR SC	.37	GAL	.53
93010	PIE/APPLE	4.15	EA.	3.94
93100	TART SHELLS	3.90	DOZ	5.53
95010	BAYLEAF	.02	LB	.02
95030	CATSUP	.60	C10	.60
95050	CHILI SAUCE	.45	C10	.49
95150	PAPRIKA	.32	LB	.44
95170	PEPPER/BLACK	.06	LB	.06
95230	SALT	.53	LB	.16
95250	THYNE	.05	LB	.04
95260	VANILLA	.07	PT	.21
95270	VINEGAR/WHITE	.28	GAL	.17
95290	WHOLE CLOVES	.02	LB	.03
97010	CORNSTARCH	.31	LB	.06
97100	WATER	8.34	XX	0

188

Figure 40.--
Output of food use
program(USEPRO), not
rounded.

322.40.

sales configuration. Comparison of these figures with requisitions or production records could turn up discrepancies in the use of certain items.

Pre-costing

After a forecast has been made it may also be desirable to pre-cost a menu for reasons discussed in Chapter IV.⁶ This can be done, using program PCSTPRO. The use of program PCSTPRO will be discussed in the next section, devoted to cost calculations, as the development of pre-cost and potential cost figures differ only in that forecast covers are used for the former and actual covers for the latter.

Calculation of Food Costs

Through use of the system it is possible to develop actual and potential costs and compare the two. The magnitude of the difference between what food costs should be (potential costs), and what they are (actual costs), indicates to a significant degree the inefficiency being experienced in this important cost area.⁷

Potential costs

Potential costs are calculated and written out into the cost file by program PCSTPRO. The program descriptions of program PCSTPRO and EVALREC, a key subroutine of the program, are shown on the next three pages in Figures 41

and 42. PCSTPRO reads the numbers of covers sold for a given menu (requested by date), calculates the potential cost per portion for each recipe, and then calculates the total potential cost for each item and for the entire menu. It reads the recipe (menu item) selling price from the recipe file and calculates to sales for each item and total menu sales. Potential costs are subtracted from sales to show variable margins, and the ratio of each menu item to total covers sold is calculated.

Banquets or a la carte "other" sales are read from the banquet file and potential costs, sales, and variable margins calculated. The potential cost as a percent of sales for the menu, banquets, and a la carte "other" are calculated, total costs and variable margins for the day are figured, and the total is printed out as shown in Figure 43. These particular costs and sales calculations were based on the inputs for January 1, 1971 illustrated in Appendices F and H. Total sales and potential costs are then written into the cost file for evaluation by a final cost program (COSTPRO).

Menu or banquet pre-costs can be made by PCSTPRO. The same logic is used as for potential costing but number of sales are read from a forecast file with menu code, rather than date, as the indentifying input. These costs and variable margins indicate the possibilities if expectations are realized. Too, new menus can be tested for expected

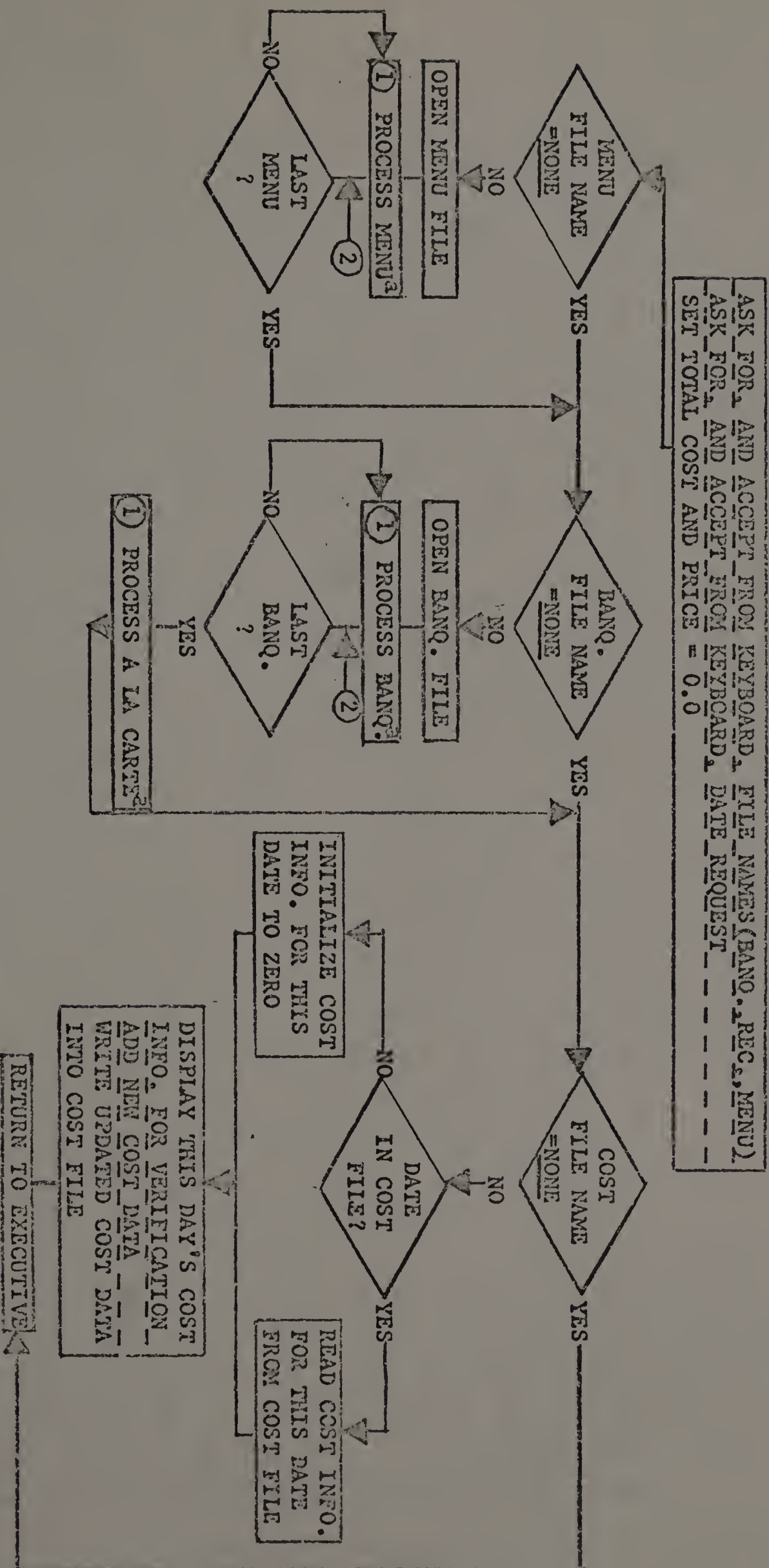


Figure 41.--Descriptive flow diagram of program PCSTPRO, a pre-cost and potential cost program.

Menu and banquet processing are similar in that they both evaluate a group of recipes. A la carte "other" recipes on banquet file are grouped together and evaluated as if they were a single banquet. The method used for evaluating a group of recipes is shown on the following page.

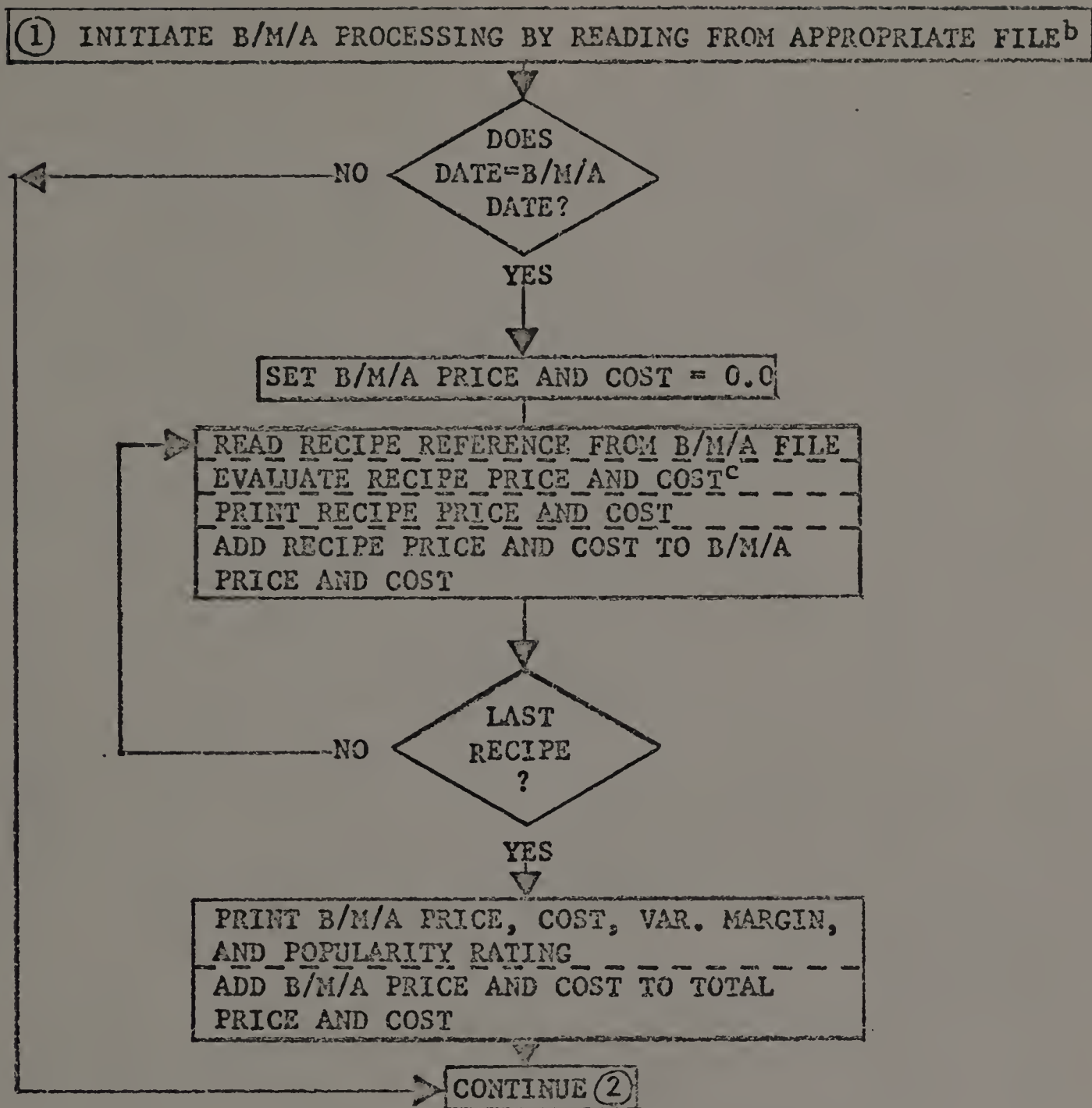


Figure 41.--Continued.

^bB/M/A refers to banquet, menu, or a la carte "other"-- depending on which of the three is being processed.

^cThe evaluation of an individual recipe is shown in Figure 42 on the following page.

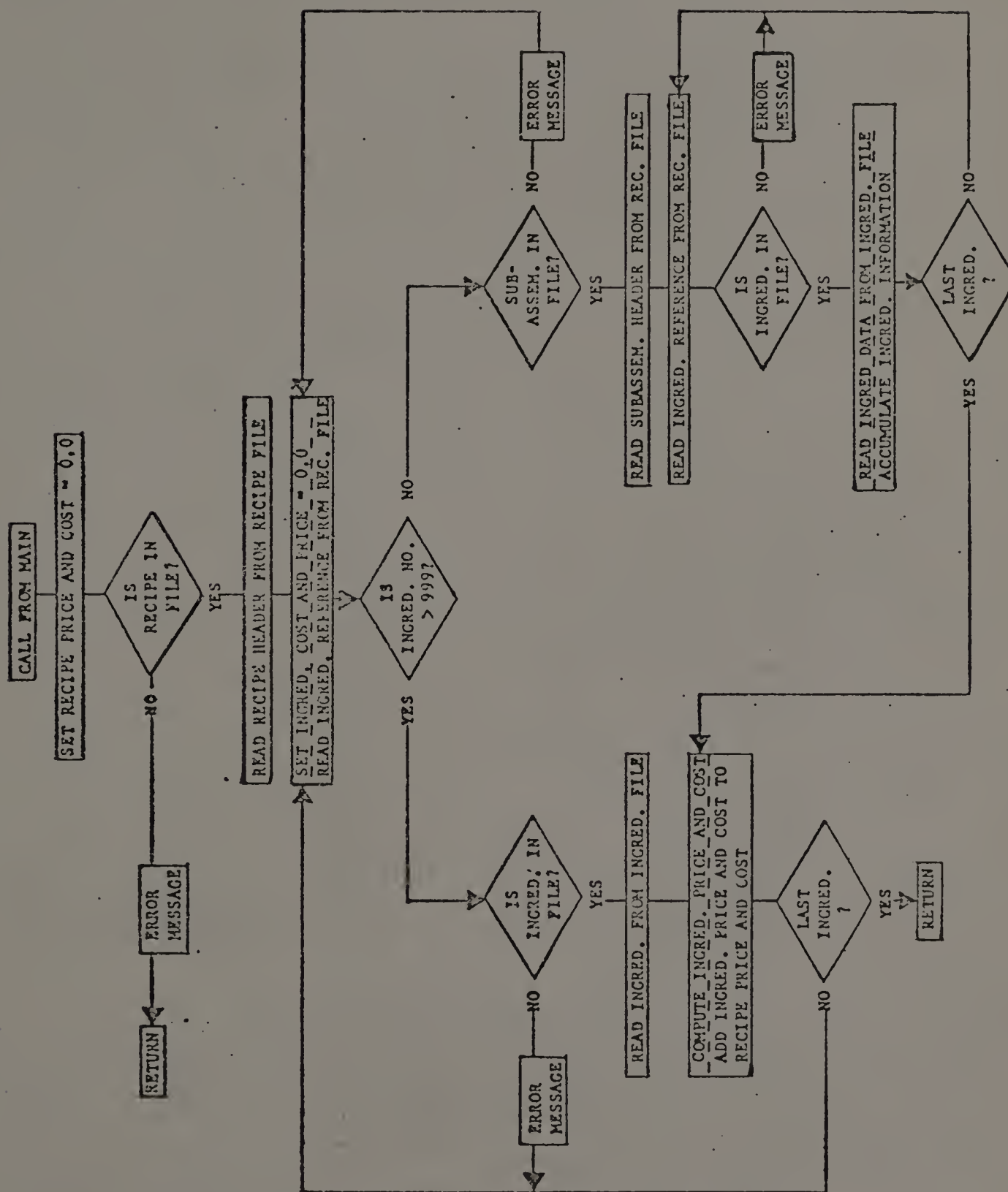


Figure 42.--Descriptive flow diagram of subroutine EVALREC, recipe price and cost evaluation subroutine for programs PCSTPRO and USEPRO.

BANQUET CODE SIMMONS

RECIPE	RECIPE NAME	SOLD	PRICE	COST	TOTSALE	TOTCOST	VARMARG	PCTTCV
12070	PEAR/PROSC HAM	50	0	.22	0	10.88	-10.88	
25070	PR RIBS OF BEEF	50	5.95	1.46	297.50	73.08	224.42	
38010	TOSSED GR SALAD	50	0	.07	0	3.34	-3.34	
38050	FR. FRIED POT.	50	0	.03	0	1.50	-1.50	
63000	ROLLS BUTTER	50	0	.15	0	7.51	-7.51	
59000	COFFEE	50	0	.06	0	2.80	-2.80	
TOTALS					297.50	99.11	198.39	

COST% = 33.32

ALA CARTE

RECIPE	RECIPE NAME	SOLD	PRICE	COST	TOTSALE	TOTCOST	VARMARG	PCTTCV
25050	ROAST TURKEY	13	3.75	.47	48.75	6.15	42.60	
TOTALS					48.75	6.15	42.60	

COST% = 12.61

OVERALL TOTALS

SALES	1204.00
COSTS	291.81
VMARG	912.19
COST%	24.24

Figure 43.--Continued.

variable margin by writing them into a dummy menu file, using MENPRO, and evaluating them with PCSTPRO. Still another feature of the program is its ability to pre-cost a banquet so the operator can check to see if his proposed banquet price will produce an acceptable margin.

Lastly, entire menu, forecast, or banquet files can be costed by inputting "0," rather than date or menu code. This feature saves considerable time if a large number of items are being costed or pre-costed.

Actual costs and analysis

The final step taken by the system to provide usable information for the food service operator is to calculate actual costs and compare them with potential costs. This is accomplished through program COSTPRO (charted in Figure 44).

COSTPRO operates on the information placed in the cost file by FILPRO2 and PCSTPRO. This file now contains the following information for each date of operation (the number of days that can be carried is limited only by the cost of disk storage--normally a year's data would be maintained):

1. Total potential cost.
2. Total sales.
3. Total issues.
4. Total food direct.

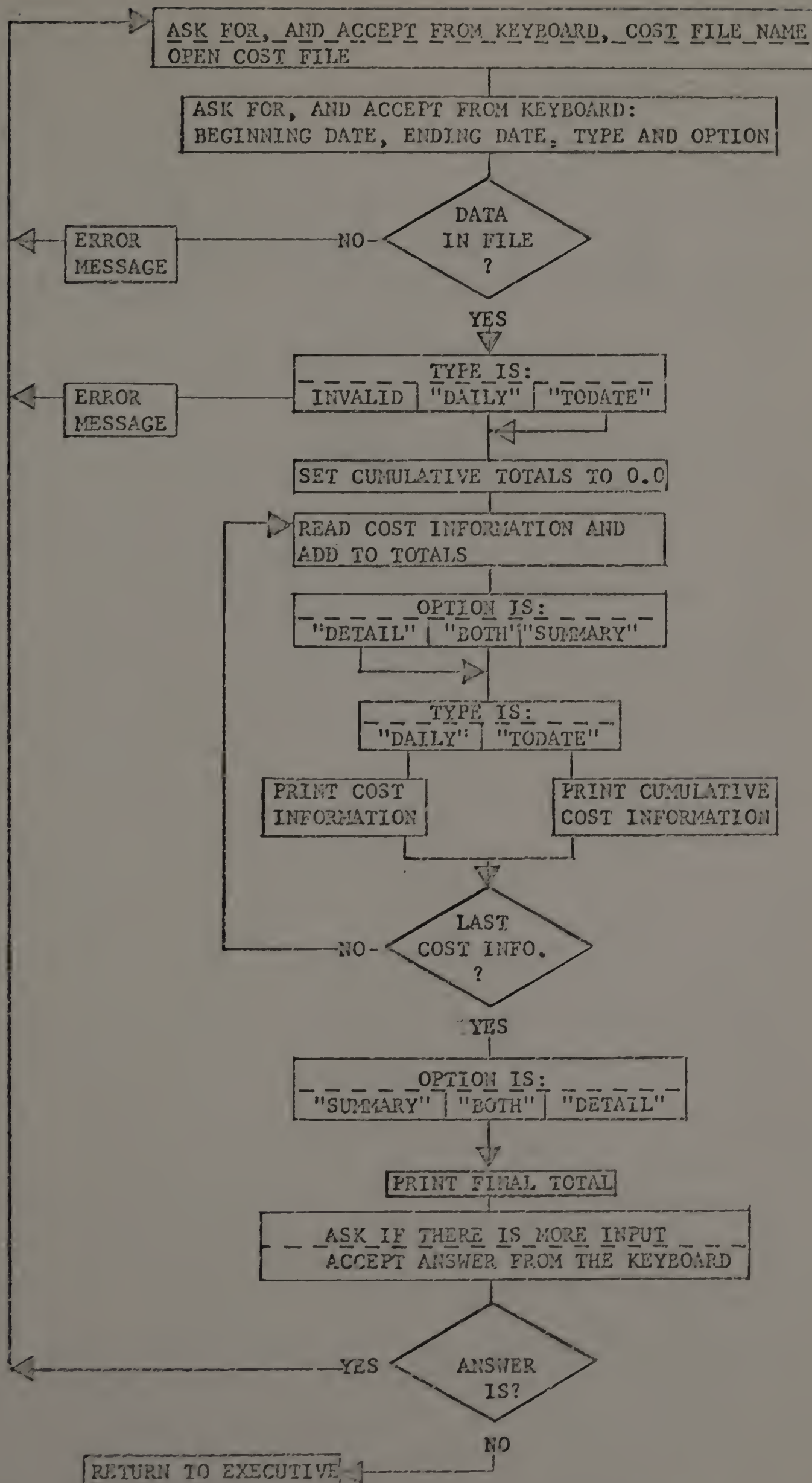


Figure 44.--Descriptive flow diagram of program COSTPRO, a cost calculation and analysis program.

5. Plus or minus transfers.

The program totals issues, food direct and transfers to obtain the estimated actual daily cost and compares this with potential cost. The difference is potential savings--defined as the amount that could have been saved if planned food costs had been obtained. Potential savings could be a negative figure (underportioning could cause this), although this result would be highly improbable.

The user has the option of obtaining daily or to-date cost information, using any start date he selects. This information can be listed in detail or it can be summarized, as shown in Figure 45.

Summary

In this section the detail and use of a model information system for planning and control has been shown through the use of diagrams, and by showing actual data inputs and outputs. Intermittent file updating, regular file updating, forecast, determining food use, pre-costing, potential cost calculations, and cost evaluation were described as handled by the system. The significance of these functions, along with some recommendations for extensions of the system, will be discussed in the next, and concluding, chapter.

EXE COSTPRO

8K
COST FILE NAME ?COSTF

DATE1,DATE2,TYPE,AND DISPLAY
?122870 10171 DAILY DETAIL

DAILY INFORMATION FROM 122870 TO 10171

DATE	SALES	ACTUAL COST	ACTUAL COST %	POT. COST	POT. SAVINGS	SAVINGS %
122870	708.65	160.00	22.58	145.19	14.81	2.09
122970	632.50	125.00	19.76	104.16	20.84	3.29
123070	819.05	203.13	24.80	182.89	20.24	2.47
123170	806.50	246.00	30.50	215.22	30.78	3.82
10171	1204.00	338.55	28.12	291.81	46.74	3.88

MORE INPUT ?YES

DATE1,DATE2,TYPE,AND DISPLAY
?122870 10171 TODATE DETAIL

TO DATE INFORMATION FROM 122870 TO 10171

DATE	SALES	ACTUAL COST	ACTUAL COST %	POT. COST	POT. SAVINGS	SAVINGS %
122870	708.65	160.00	22.58	145.19	14.81	2.09
122970	1341.15	285.00	21.25	249.35	35.65	2.66
123070	2160.20	488.13	22.60	432.24	55.89	2.59
123170	2966.70	734.13	24.75	647.46	86.67	2.92
10171	4170.70	1072.68	25.72	939.27	133.41	3.20

MORE INPUT ?NO

PROGRAM NAME ?EXIT

TIME: 0.274 SEC.

Figure 45.--Daily and to-date food costs displayed
by program COSTPRO.

FOOTNOTES

¹See p. 175.

²See the discussion of estimated food costs in Chapter IV (pp. 106-112).

³The material in this section was first presented by the author as an invited paper at Science of Survival/70 (SOS/70), Washington, D.C. (August 14, 1970).

⁴See Brown, pp. 1-159, for a presentation of the method of forecasting using exponential smoothing.

⁵Alpha is a constant with a value between zero and one.

⁶See above, p. 113.

⁷See above, p. 117.

C H A P T E R V I I

EVALUATION OF THE SYSTEMS MODEL

This paper has outlined the need for, developed, and tested a systems model of an information system for the planning and control of food cost in commercial food service operations. To this extent it has fulfilled the purpose set forth on page 1 of Chapter I. There are, however, further considerations which must be taken into account before the success of the undertaking can be fully assured.

The need for further testing

That the system works when applied to simulated conditions is unquestionable. What is needed is further testing under actual conditions. The model, made as realistic as possible under the assumptions used, still may lack those little surprises that are an integral part of actual operations.

As a first test, it would be recommended that an operation with a single menu be used. This would present the most favorable condition for the use of the forecasting feature, probably the largest question mark in the model. The system could be run in parallel with whatever current system is being used in the test operation until confidence

in the system capability was achieved.

Potential problems

A potential problem in the use of the system could lie in the problem of inputting sales and cost data, particularly in the larger operations. In the first place, it is in the input and output processes that humans must interact with the system. Unfortunately, humans are more mistake-prone than machines where routine operations are of concern. Secondly, a problem is created by the sheer amount of recipe sales data, purchase data, and issues data indigenous to a large operation.

A potential solution to this problem lies in the use of different types of terminal devices than the teletype. An example of such a device, now on the market, is the Documentor--manufactured and sold by the Documentor Sciences Corporation, 2921 S. Daimler, Santa Ana, California. This device, really a mini-computer, has the capability of reading mark-sensed input records. A sales check that can be used in this system is shown in Figure 46. The check is marked as shown by the waitress when the guest order is taken. The check is then fed into a small computer which selects the proper program to record the data. The time is recorded on the check, and if desired, a cash drawer is automatically opened to accept payment. There are no buttons or any other device for the operator

BREAKFAST

Mr. Pickwick

DATE 0021 | TIME 933

WAIT NO. TOTAL \$ 460

DELETE AMOUNT \$

☒ FIRST CHECK ☐ DELETE CHECK NO. 1

TABLE NO.	100	200	300	400	500	600	700	800	900
NO.	0	20	30	40	50	60	70	80	90
COVER	0	1	2	3	4	5	6	7	8

Appetizers

50	S. O JUICE	\$49	1	2	4
51	L. O JUICE	\$70	1	2	4
52	TOMATO JUICE	\$35	1	2	4
53	G. F. JUICE	\$35	1	2	4
54	PINEAPPLE	\$35	1	2	4
55	MELON	\$60	1	2	4
56	GRAPEFRUIT	\$50	1	2	4
57	COMPOSITE	\$65	1	2	4
58	BERRIES	\$75	1	2	4

Pease Horridge

59	M. DRY CER.	\$45	1	2	4
60	C. DRY CER.	\$55	1	2	4
61	M. HOT CER.	\$45	1	2	4
62	C. HOT CER.	\$55	1	2	4
63	CER. & FRUIT	\$35	1	2	4
64	SPECIAL		1	2	4

Beverages

65	COFFEE	\$25	1	2	4
66	TEA	\$25	1	2	4
67	HOT CHOC.	\$25	1	2	4
68	SANKA	\$25	1	2	4
69	POSTUM	\$25	1	2	4
70	MILK	\$30	1	2	4

Griddle Gems

71	GRIDDLE C.	\$95	1	2	4
72	WAFFLE	\$95	1	2	4
73	FRENCH TOAST	\$100	1	2	4

Toasts & Sweets

74	E. MUFFIN	\$35	1	2	4
75	TOAST	\$30	1	2	4
76	CIN. TOAST	\$35	1	2	4
77	DANISH	\$35	1	2	4
78	BISCUITS	\$25	1	2	4
79	DOUGHNUTS	\$35	1	2	4

Scotsman's Breakfast

80	NUMBER 1	\$225	1	2	4
81	NUMBER 2	\$135	1	2	4
82	NUMBER 3	\$225	1	2	4
83	NUMBER 4	\$160	1	2	4
84	NUMBER 5	\$350	1	2	4

Royalty Breakfast

85	ONE EGG	\$45	1	2	4
86	TWO EGGS	\$85	1	2	4
87	HASHED BRNS	\$30	1	2	4
88	BACON	\$75	1	2	4
89	SAUSAGE	\$75	1	2	4
90	HAM STEAK	\$90	1	2	4
91	STEAK	\$275	1	2	4

A La Carte

92	PLAIN	\$110	1	2	4
93	CHEESE	\$140	1	2	4
94	HAM	\$160	1	2	4
95	WESTERN	\$175	1	2	4

Omelettes

96	ONE EGG	\$95	1	2	4
97	GRIDDLE C.	\$95	1	2	4

Meat & Cheese

98	MILK				
99	H. CH.				

\$ 0 1 2 3 4 5 SPEC ☐ ☐ ☐

c 0 10 20 30 40 50 60 70 80 90

90044 B Documentor Sciences Corp. 1970 Documentor™

Figure 46.--Sales check used in the Documentor system.

to hit, miss, or neglect. If there is an error in the data, the machine simply pushes the check back out to the operator. At the other end of the system, an inventory entry document allows the item code, quantity, and price to be entered the same way.

At the end of each day it would be possible for the cost and sales information held in the Documentor to be transmitted automatically to the files of the master computer.

The initial cost of such a system would be considerably higher (\$8,000-\$10,000) than if only a teletype were used. It would be assumed that an operation large enough to need such a device would also be able to justify the cost.

Another potential problem is inherent in the length of time necessary to build up recipe sales information if several menus are used in a cycle. The more menus in the cycle, the more time is needed to accumulate comparable statistics. There is no way to get around this problem except to use the smallest number of menus possible. Fortunately, the success of specialty restaurants and "one menu" establishments would appear to indicate that a large number of different menus are not essential to success in commercial restaurants.

A last, readily observable, shortcoming of the system is that only one price, the last, is retained for each food

item. This factor aids comparisons between potential and actual costs by assuring that they are calculated on the same base prices. For inventory valuations to be used in calculating cost for the formal income statement, however, it would be desirable that it be possible to calculate the actual value of goods in inventory, using LIFO, FIFO, or some other standard inventory valuation system. Fortunately, this objection can be easily overcome by creating additional price slots for each food item in inventory. One price is then used until the items to which it related are used up, at which time the "new" price comes into use. This feature was left out of the model because the use of BCD files limited, for practical purposes, the length of the record used.

This leads into a final recommendation: that binary files be used in actual operation--primarily because of their greater flexibility and ease of programming.

Some extensions of the system

A very useful addition to the system would be the incorporation of an expanded system of information inventory and purchasing control. This could be as simple as the par-stock and mini-max systems discussed in Chapter IV.¹ Another possibility would be the use of standard E.O.Q. (economic order quantity) formulas.² A third possibility could be a joint order cost

formulation such as that proposed by Balintfy.³

Another possible addition would be the capability of using the ingredient codes to break both potential and actual costs down into various food groupings. This would enable a food service operator to pinpoint the area of food losses more readily than would be possible under the system as proposed.

The successful advent of the computer into the area of food cost operation could open up possibilities for the use of operations research techniques for production control. Models could be constructed of normal operating patterns at different times of the day and at different points in a given meal. A plot of actual performance against this norm, displayed on cathode ray tubes, would aid the food service operator in those on-the-spot operating decisions that are an integral part of food service management.

Finally, the proposed system serves only one part of the information needed by food service operators. Beverage costs, wage costs, productivity data, the list of information needs that should be served by a total food service information system are practically limitless. When confidence of food service management is gained in the use of the computer as a managerial tool, it might be expected that there will be no dearth of proposed future applications.

FOOTNOTES

¹Above, p. 88.

²For a discussion relating the E.O.Q. to food service see: Eileen Matthews, "Economic Evaluation of Food Procurement Models," Proceedings of the 23rd Conference of the Society for the Advancement of Food Service Research (Oakbrook, Ill.: Society for the Advancement of Food Service Research, Spring, 1971).

³Balintfy, "On a Class of Multi-Item Inventory Problems."

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APPENDIX A

INGREDIENT PRIMARY AND SUBGROUP CODES

Fats & Oils

Shortenings	10
Frying Fats	11
Salad Oils	12
Salad Dressings	13
Butter	14

Fruits & Fruit Products

Canned Fruits	20
Canned Fruit Juices	21
Fruit Concentrates	22
Fresh Fruits	23
Fresh Fruit Juices	24
Frozen Fruit	25
Frozen Fruit Juices	26
Dried Fruits	27

Grain & Grain Products

Breads	30
Rolls	31
Cakes	32
Flour	33
Pasta	34

Crackers 35

Nuts & Soybeans

Nuts 40

Soybean Products 41

Coconut 42

Meat, Poultry, Fish, Eggs

Beef 50

Pork 51

Veal 52

Lamb 53

Wild Game 54

Eggs 55

Poultry 56

Fish 57

Shellfish 58

Miscellaneous (sausage, etc.) 59

Milk & Milk Products

Fluid & Dried Milk 60

Cream 61

Ice Cream 62

Sherberts 63

Cheese and Cheese Products 64

Sugars & Sweets

Sugar	70
Syrups, honey, molasses	71
Jellies	72
Toppings, other than chocolate	73
Sauces	74
Candies	75
Chocolate, cocoa, etc.	76
Gelatin desserts	77
Cordials	78

Vegetables

Canned Vegetables & Juices	80
Fresh Vegetables (Except Potatoes)	81
Potatoes, Fresh & Dried	82
Frozen Vegetables	83
Dried Vegetables	84

Miscellaneous

Soups	90
Beverages & Soft Drinks	91
Sauces & Sauce Mixes	92
Pre-prepared pies & tarts	93
Puddings, pie mixes & fillings	94
Spices, colorings, flavorings	95
Wine	96
All other - Bouillon, plain gelatin, yeast, baking powder, etc.	97

APPENDIX B

RECIPE CODE COURSE DESIGNATION

Subassemblies	00000 - 00999
Appetizers	10000 - 19999
Entrees	20000 - 29999
Salads, Vegetables	30000 - 39999
Desserts	40000 - 49999
Beverages	50000 - 59999
Breads	60000 - 69999

APPENDIX C

MENU FILE

48	552								
1	HEADER	122570	145	770.00	148.30	+2.117	151	0	
2	HEADER	122670	152	820.00	152.04	+1.874	148	0	
3	HEADER	122870	145	973.00	146.18	+2.322	149	0	
4	HEADER	122970	147	657.00	146.25	+2.404	147	0	
5	HEADER	123070	146	691.00	147.43	+2.470	148	0	
6	HEADER	123170	147	703.00	151.45	+1.979	149	0	
11	HEADER	121170	146	620.00	153.67	+1.313	151	12	
11	12080	TOMATO JUICE CT	82		.46	.020			
11	15090	SHRIMP COCKTAIL	40		.14	.002			
11	25180	FILET MIGNON	54		.48	.015			
11	25190	BEEF POT PIE	54		.20	.011			
11	25200	HALF BR. CHIX	48		.27	.009			
11	38010	TOSSED GR SALAD	107		.62	.034			
11	38050	FR. FRIED POT.	108		.58	.036			
11	46130	STRAWBY PARFAIT	33		.22	.005			
11	49120	APPLE PIE	35		.11	.006			
11	59000	COFFEE	95		.54	.027			
11	59100	MILK GLASS	40		.29	.021			
11	63000	ROLLS BUTTER	125		.67	.023			
12	HEADER	120470	153	687.00	154.06	+1.854	154	12	
12	12070	PEAR PROSC HAM	85		.48	.018			
12	15050	MARINATED HERRIN	39		.31	.015			
12	25010	LAMB, ROAST LEG	57		.31	.016			
12	25020	BEEF STROGANOFF	67		.39	.024			
12	25030	CLAMS FRIED	41		.30	.020			
12	38010	TOSSED GR SALAD	90		.71	.045			
12	38020	BAK STUFF POTATO	88		.75	.046			
12	42010	CHOC PARFAIT	12		.24	.011			
12	49020	ORANGE CHIF PIE	38		.21	.007			
12	59000	COFFEE	100		.58	.022			
12	59100	MILK GLASS	28		.24	.007			
12	63000	ROLLS BUTTER	112		.82	.036			
13	HEADER	112770	150	783.00	156.44	+1.543	155	12	
13	12060	MINTED FRUIT CUP	44		.57	.039			
13	15030	CHERRY STONES	40		.19	.010			
13	25070	PR RIBS OF BEEF	72		.34	.020			
13	25080	BR. VEAL CUTLET	30		.38	.023			
13	25110	FILLET OF SOLE	48		.23	.022			
13	38010	TOSSED GR SALAD	139		.58	.044			
13	38040	AU GRATIN POTATO	82		.60	.045			
13	46060	C D MENTH PARFAI	23		.24	.020			
13	49050	PEACH TART	23		.11	.012			
13	59000	COFFEE	100		.64	.040			
13	59100	MILK GLASS	50		.14	.015			
13	63000	ROLLS BUTTER	117		.73	.058			
14	HEADER	112070	154	790.00	157.88	+1.607	157	12	
14	12080	TOMATO JUICE CT	51		.30	.025			
14	15010	BLUEPOINTS H SHL	41		.28	.026			
14	25050	ROAST TURKEY	31		.21	.017			
14	25060	BR LIVE LOBSTER	44		.28	.021			

14	25190	BEEF POT PIE	61	.49	.042		
14	38010	TOSSED GR SALAD	133	.83	.072		
14	38050	FR. FRIED POT.	107	.49	.043		
14	46040	BLUEBRY PARFAIT	29	.20	.017		
14	49030	RHUBARB PIE	36	.11	+.001		
14	59000	COFFEE	116	.57	.039		
14	59100	MILKGLASS	11	.26	.014		
14	63000	ROLLS BUTTER	121	.72	.052		
15	HEADER	111370	155	830.00	159.57	+1.558	161 12
15	12040	CRANBERRY SHRUB	30	.33	.023		
15	15030	CHERRYSTONES	64	.29	.023		
15	25040	BEEF JARDINIERE	40	.24	.026		
15	25100	SIRLOIN STRIP	12	.41	.029		
15	25110	FILLET OF SOLE	61	.31	.025		
15	38010	TOSSED GR SALAD	103	.79	.052		
15	38020	BAK STUFF POTATO	100	.63	.045		
15	42010	CHOC PARFAIT	45	.19	.011		
15	49070	LEMON CHIF PIE	36	.20	.010		
15	59000	COFFEE	92	.72	.061		
15	59100	MILKGLASS	44	.10	.011		
15	63000	ROLLS BUTTER	127	.72	.057		
16	HEADER	122570	145	770.00	148.30	+2.117	151 12
16	12060	MINTED FRUIT CUP	51	.42	.021		
16	14020	CELERYBLEU CH	30	.20	.007		
16	25150	TENDERLOIN TIPS	38	.30	.009		
16	25160	BR. LAMB CHOPS	71	.29	.008		
16	25170	CHIX ALA MARYLAND	47	.39	.022		
16	38010	TOSSED GR SALAD	80	.61	.037		
16	38040	AU GRATIN POTATO	100	.61	.034		
16	46060	C D MENTH PARFAI	19	.30	.013		
16	49110	APRICOT PIE	37	.22	.014		
16	59000	COFFEE	84	.59	.026		
16	59100	MILKGLASS	42	.27	.015		
16	63000	ROLLS BUTTER	85	.81	.035		
17	HEADER	121870	144	800.00	150.83	+1.877	151 12
17	12040	CRANBERRY SHRUB	70	.25	.020		
17	15010	BLUEPOINTS	20	.33	.012		
17	25120	SWEDISH STEAK	76	.23	.006		
17	25130	BA STUFF SHRIMP	28	.48	.030		
17	25140	CHIX POT PIE	39	.27	.006		
17	38010	TOSSED GR SALAD	89	.58	.034		
17	38030	HASH BR POTATO	90	.67	.037		
17	42010	CHOC PARFAIT	31	.18	.004		
17	49090	BLUEBERRY TART	12	.30	.020		
17	59000	COFFEE	89	.55	.036		
17	59100	MILKGLASS	46	.31	.019		
17	63000	ROLLS BUTTER	104	.61	.029		
21	HEADER	121970	150	654.00	153.23	+2.272	152 12
21	12080	TOMATO JUICE CT	55	.34	.013		
21	15090	SHRIMP COCKTAIL	30	.22	.009		
21	25180	FILET MIGNON	47	.50	.027		

21	25190	BEEF POT PIE	66	.21	.014		
21	25200	HALF BR. CHIX	33	.31	.019		
21	38010	TOSSED GR SALAD	46	.43	.024		
21	38050	FR. FRIED POT.	106	.67	.030		
21	46130	STRAWBY PARFAIT	27	.26	.005		
21	49120	APPLE PIE	39	.12	.001		
21	59000	COFFEE	83	.52	.027		
21	59100	MILK+GLASS	55	.28	.018		
21	63000	ROLLS BUTTER	87	.80	.044		
22	HEADER	121270 149	640.00	155.72	+2.148	154	12
22	12070	PEAR+PROSC HAM	54	.38	.015		
22	15050	MARINATED HERRIN	37	.22	.006		
22	25010	LAMB, ROAST LEG	33	.27	.009		
22	25020	BEEF STROGANOFF	64	.47	.030		
22	25030	CLAMS+FRIED	67	.22	.007		
22	38010	TOSSED GR SALAD	93	.33	.019		
22	38020	BAK STUFF POTATO	123	.68	.031		
22	42010	CHOC PARFAIT	16	.29	.011		
22	49020	ORANGE CHIF PIE	34	.19	.015		
22	59000	COFFEE	95	.56	.032		
22	59100	MILK+GLASS	35	.31	.013		
22	63000	ROLLS BUTTER	140	.59	.030		
23	HEADER	120570 152	757.00	157.90	+2.127	157	12
23	12060	MINTED FRUIT CUP	35	.34	.011		
23	15030	CHERRYSTONES	50	.23	.008		
23	25070	PR RIBS OF BEEF	98	.19	.015		
23	25080	BR. VEAL CUTLET	34	.40	.024		
23	25110	FILLET OF SOLE	38	.38	.011		
23	38010	TOSSED GR SALAD	117	.58	.029		
23	38040	AU GRATIN POTATO	73	.78	.040		
23	46060	C D MENTH PARFAI	26	.25	.022		
23	49050	PEACH TART	21	.13	.005		
23	59000	COFFEE	102	.61	.037		
23	59100	MILK+GLASS	12	.24	.014		
23	63000	ROLLS BUTTER	123	.90	.050		
24	HEADER	112870 154	790.00	160.19	+2.033	160	12
24	12080	TOMATO JUICE CT	45	.27	.025		
24	15010	BLUEPOINTS+H SHL	46	.31	.016		
24	25050	ROAST TURKEY	37	.19	.010		
24	25060	BR LIVE LOBSTER	58	.17	.008		
24	25190	BEEF POT PIE	59	.58	.045		
24	38010	TOSSED GR SALAD	105	.69	.047		
24	38050	FR. FRIED POT.	112	.49	.041		
24	46040	BLUEBRY PARFAIT	26	.23	.023		
24	49030	RHUBARB PIE	30	.18	.020		
24	59000	COFFEE	91	.68	.052		
24	59100	MILK+GLASS	33	.13	.011		
24	63000	ROLLS BUTTER	122	.72	.045		
25	HEADER	112170 156	860.00	162.64	+1.782	163	12
25	12040	CRANBERRY SHRUB	40	.28	.021		
25	15030	CHERRYSTONES	56	.24	.013		

25	25040	BEEF JARDINIERE	33	.23	.012		
25	25100	SIRLOIN STRIP#12	35	.37	.025		
25	25110	FILLET OF SOLE	83	.36	.030		
25	38010	TOSSED GR SALAD	91	.68	.051		
25	38020	BAK STUFF POTATO	106	.66	.046		
25	42010	CHOC PARFAIT	50	.19	.022		
25	49070	LEMON CHIF PIE	35	.17	.012		
25	59000	COFFEE	105	.60	.046		
25	59100	MILK#GLASS	37	.22	.017		
25	63000	ROLLS BUTTER	133	.77	.053		
26	HEADER	111470 158 800.00	165.37	+1.227		166	12
26	12060	MINTED FRUIT CUP	68	.33	.028		
26	14020	CELERY#BLEU CH	37	.21	.021		
26	25150	TENDERLOIN TIPS	45	.21	.012		
26	25160	BR. LAMB CHOPS	69	.24	.019		
26	25170	CHIX ALA MARYLND	54	.48	.036		
26	38010	TOSSED GR SALAD	125	.63	.053		
26	38040	AU GRATIN POTATO	99	.64	.039		
26	46060	C D MENTH PARFAI	35	.32	.022		
26	49110	APRICOT PIE	53	.24	.014		
26	59000	COFFEE	91	.67	.054		
26	59100	MILK#GLASS	49	.17	.015		
26	63000	ROLLS BUTTER	144	.77	.064		
27	HEADER	122670 152 820.00	152.04	+1.874		148	12
27	12040	CRANBERRY SHRUB	47	.22	.012		
27	15010	BLUEPOINTS#H SHL	34	.39	.023		
27	25120	SWEDISH STEAK	73	.28	.010		
27	25130	BA STUFF SHRIMP	24	.38	.027		
27	25140	CHIX POT PIE	47	.31	.019		
27	38010	TOSSED GR SALAD	71	.72	.047		
27	38030	HASH BR POTATO	104	.57	.034		
27	42010	CHOC PARFAIT	36	.19	.017		
27	49090	BLUEBERRY TART	26	.30	.021		
27	59000	COFFEE	82	.56	.027		
27	59100	MILK#GLASS	46	.29	.015		
27	63000	ROLLS BUTTER	124	.70	.034		
31	HEADER	122870 145 973.00	146.18	+2.322		149	12
31	12080	TOMATO JUICE CT	47	.27	.021		
31	15090	SHRIMP COCKTAIL	36	.23	.013		
31	25180	FILET MIGNON	34	.48	.022		
31	25190	BEEF POT PIE	59	.20	.003		
31	25200	HALF BR. CHIX	54	.28	.019		
31	38010	TOSSED GR SALAD	97	.54	.030		
31	38050	FR. FRIED POT.	78	.76	.039		
31	46130	STRAWBY PARFAIT	35	.22	.013		
31	49120	APPLE PIE	46	.20	.017		
31	59000	COFFEE	87	.54	.022		
31	59100	MILK#GLASS	39	.34	.018		
31	63000	ROLLS BUTTER	101	.72	.031		
32	HEADER	122170 140 732.00	149.82	+1.552		150	12
32	12070	PEAR#PROSC HAM	53	.29	.011		

32	15050	MARINATED HERRIN	51	.28	.012		
32	25010	LAMB, ROAST LEG	35	.27	.020		
32	25020	BEEF STROGANOFF	59	.40	.025		
32	25030	CLAMS FRIED	65	.33	.010		
32	38010	TOSSED GR. SALAD	105	.68	.029		
32	38020	BAK STUFF POTATO	113	.54	.025		
32	42010	CHOC PARFAIT	25	.35	.023		
32	49020	ORANGE CHIF PIE	28	.27	.020		
32	59000	COFFEE	92	.58	.031		
32	59100	MILK GLASS	30	.33	.018		
32	63000	ROLLS BUTTER	91	.66	.034		
33	HEADER	121470	146	700.00	152.06	+1.147	148 12
33	12060	MINTED FRUIT CUP	28	.34	.015		
33	15030	CHERRY STONES	33	.30	.016		
33	25070	PR RIBS OF BEEF	79	.19	.012		
33	25080	BR. VEAL CUTLET	30	.38	.027		
33	25110	FILLET OF SOLE	42	.43	.028		
33	38010	TOSSED GR. SALAD	120	.73	.031		
33	38040	AU GRATIN POTATO	66	.73	.034		
33	46060	C D MENTH PARFAIT	22	.21	.013		
33	49050	PEACH TART	19	.13	+.003		
33	59000	COFFEE	108	.59	.020		
33	59100	MILK GLASS	38	.22	.013		
33	63000	ROLLS BUTTER	109	.63	.031		
34	HEADER	120770	153	953.00	151.50	+2.147	152 12
34	12080	TOMATO JUICE CT	38	.21	.011		
34	15010	BLUE POINTS NH SHL	52	.21	.019		
34	25050	ROAST TURKEY	63	.20	.020		
34	25060	BR LIVE LOBSTER	29	.30	.025		
34	25130	BEEF POT PIE	63	.52	.028		
34	38010	TOSSED GR. SALAD	10	.73	.048		
34	38050	FR. FRIED POT.	90	.39	.023		
34	46040	BLUEBRY PARFAIT	16	.17	.012		
34	49030	PRUDARE PIE	35	.18	.010		
34	59000	COFFEE	87	.66	.027		
34	59100	MILK GLASS	39	.17	.005		
34	63000	ROLLS BUTTER	101	.68	.037		
35	HEADER	113070	146	822.00	154.73	+1.509	156 12
35	12040	CRAIDERRY SHRUB	24	.21	.013		
35	15030	CHERRY STONES	75	.37	.028		
35	25040	BEEF JARDINIERE	34	.38	.023		
35	25100	SIRLOIN STRIP #12	41	.43	.025		
35	25110	FILLET OF SOLE	67	.15	.007		
35	38010	TOSSED GR. SALAD	113	.79	.066		
35	38020	BAK STUFF POTATO	106	.59	.041		
35	42010	CHOC PARFAIT	55	.11	.007		
35	49070	LEMON CHIF PIE	38	.27	.015		
35	59000	COFFEE	103	.54	.046		
35	59100	MILK GLASS	28	.23	.022		
35	63000	ROLLS BUTTER	124	.69	.053		
36	HEADER	112370	150	843.00	157.01	+.763	157 12

36	12060	MINTED FRUIT CUP	62	.48	.037		
36	14020	CELERY BLEU CH	41	.17	.011		
36	25150	TENDERLOIN TIPS	44	.31	.030		
36	25160	BR. LAMB CHOPS	80	.21	.010		
36	25170	CHIX ALA MARYLND	29	.46	.044		
36	38010	TOSSED GR SALAD	90	.71	.057		
36	38040	AU GRATIN POTATO	77	.65	.043		
36	46060	C D MENTH PARFAI	40	.36	.020		
36	49110	APRICOT PIE	56	.25	.017		
36	59000	COFFEE	87	.68	.052		
36	59100	MILK GLASS	41	.17	.009		
36	63000	ROLLS BUTTER	119	.82	.057		
37	HEADER	111670 156 742.00	158.40	+.689		158	12
37	12040	CRANBERRY SHRUB	49	.30	.030		
37	15010	BLUEPOINTS H SHL	38	.36	.032		
37	25120	SWEDISH STEAK	68	.24	.015		
37	25130	BA STUFF SHRIMP	28	.53	.044		
37	25140	CHIX POT PIE	51	.22	.013		
37	38010	TOSSED GR SALAD	89	.58	.049		
37	38030	HASH BR POTATO	123	.46	.037		
37	42010	CHOC PARFAIT	37	.18	.013		
37	49090	BLUEBERRY TART	38	.30	.020		
37	59000	COFFEE	81	.53	.038		
37	59100	MILK GLASS	54	.22	.012		
37	63000	ROLLS BUTTER	110	.77	.056		
41	HEADER	111770 152 850.00	155.31	+1.025		153	12
41	12080	TOMATO JUICE CT	40	.25	.012		
41	15090	SHRIMP COCKTAIL	70	.28	.030		
41	25180	FILET MIGNON	50	.48	.034		
41	25190	BEEF POT PIE	55	.21	.018		
41	25200	HALF BR. CHIX	44	.29	.012		
41	38010	TOSSED GR SALAD	49	.62	.043		
41	38050	FR. FRIED POT.	123	.60	.048		
41	46130	STRAWBY PARFAIT	28	.17	.006		
41	49120	APPLE PIE	44	.16	.009		
41	59000	COFFEE	94	.52	.038		
41	59100	MILK GLASS	37	.23	.024		
41	63000	ROLLS BUTTER	122	.62	.047		
42	HEADER	122970 147 657.00	146.25	+2.404		147	12
42	12070	PEAR PROSC HAM	35	.27	.010		
42	15050	MARINATED HERRIN	59	.40	.029		
42	25010	LAMB, ROAST LEG	36	.31	.014		
42	25020	BEEF STROGANOFF	35	.37	.016		
42	25030	CLAMS FRIED	69	.28	.015		
42	38010	TOSSED GR SALAD	100	.34	.010		
42	38020	BAK STUFF POTATO	58	.78	.036		
42	42010	CHOC PARFAIT	23	.24	.018		
42	49020	ORANGE CHIF PIE	24	.16	.010		
42	59000	COFFEE	76	.59	.033		
42	59100	MILK GLASS	46	.19	.020		
42	63000	ROLLS BUTTER	119	.73	.047		

43	HEADER	122270	139	976.00	150.51	+1.316	151 12
43	12080	TOMATO JUICE CT	41		.27	.017	
43	15010	BLUEPOINTS ^{WH} SHL	28		.38	.021	
43	25050	ROAST TURKEY	30		.29	.019	
43	25060	BR LIVE LOBSTER	31		.44	.021	
43	25190	BEEF POT PIE	82		.26	.010	
43	38010	TOSSED GR SALAD	30		.74	.037	
43	38050	FR. FRIED POT.	61		.40	.018	
43	46040	BLUEBRY PARFAIT	31		.15	.003	
43	49030	RHUBARB PIE	24		.15	.008	
43	59000	COFFEE	92		.54	.006	
43	59100	MILK ^W GLASS	41		.30	.012	
43	63000	ROLLS BUTTER	105		.80	.046	
44	HEADER	121570	147	691.00	152.57	+.879	152 12
44	12080	TOMATO JUICE CT	53		.24	.015	
44	15010	BLUEPOINTS ^{WH} SHL	62		.22	.005	
44	25050	ROAST TURKEY	65		.19	.002	
44	25060	BR LIVE LOBSTER	35		.24	.012	
44	25190	BEEF POT PIE	61		.54	.033	
44	38010	TOSSED GR SALAD	94		.69	.037	
44	38050	FR. FRIED POT.	91		.38	.026	
44	46040	BLUEBRY PARFAIT	13		.22	.015	
44	49030	RHUBARB PIE	39		.15	.002	
44	59000	COFFEE	87		.59	.025	
44	59100	MILK ^W GLASS	30		.26	.021	
44	63000	ROLLS BUTTER	96		.72	.036	
45	HEADER	120870	151	673.00	153.49	+.855	155 12
45	12040	CRANBERRY SHRUB	45		.37	.018	
45	15030	CHERRYSTONES	69		.39	.019	
45	25040	BEEF JARDINIERE	42		.42	.030	
45	25100	SIRLOIN STRIP ^W 12	55		.39	.018	
45	25110	FILLET OF SOLE	53		.21	.016	
45	38010	TOSSED GR SALAD	101		.65	.038	
45	38020	BAK STUFF POTATO	71		.61	.028	
45	42010	CHOC PARFAIT	53		.12	.008	
45	49070	LEMON CHIF PIE	35		.23	.014	
45	59000	COFFEE	93		.55	.021	
45	59100	MILK ^W GLASS	27		.22	.004	
45	63000	ROLLS BUTTER	125		.63	.029	
46	HEADER	120170	150	830.00	155.53	+.155	152 12
46	12060	MINTED FRUIT CUP	38		.46	.031	
46	14020	CELERY ^W BLEU CH	57		.23	.019	
46	25150	TENDERLOIN TIPS	32		.32	.034	
46	25160	BR. LAMB CHOPS	89		.28	.021	
46	25170	CHIX ALA MARYLND	37		.40	.038	
46	38010	TOSSED GR SALAD	96		.60	.047	
46	38040	AU GRATIN POTATO	105		.45	.034	
46	46060	C D MENTH PARFAI	28		.36	.022	
46	49110	APRICOT PIE	64		.19	.013	
46	59000	COFFEE	106		.60	.050	
46	59100	MILK ^W GLASS	28		.23	.019	

46	63000	ROLLS BUTTER	104	.77	.052		
47	HEADER 112470	158	922.00	154.08	+1.098	154	12
47	12040	CRANBERRY SHRUB	36	.37	.022		
47	15010	BLUEPOINTS ^{SH} SHL	35	.29	.024		
47	25120	SWEDISH STEAK	70	.21	.024		
47	25130	BA STUFF SHRIMP	29	.52	.030		
47	25140	CHIX POT PIE	40	.23	.025		
47	38010	TOSSED GR SALAD	105	.58	.041		
47	38030	HASH BR POTATO	102	.65	.049		
47	42010	CHOC PARFAIT	29	.18	.017		
47	49090	BLUEBERRY TART	19	.36	.026		
47	59000	COFFEE	85	.69	.046		
47	59100	MILK ^{GLASS}	31	.22	.015		
47	63000	ROLLS BUTTER	106	.65	.051		
51	HEADER 112570	155	910.00	157.55	+1.167	155	12
51	12080	TOMATO JUICE CT	38	.23	.010		
51	15090	SHRIMP COCKTAIL	45	.31	.024		
51	25180	FILET MIGNON	56	.50	.041		
51	25190	BEEF POT PIE	36	.20	.017		
51	25200	HALF BR. CHIX	47	.30	.028		
51	38010	TOSSED GR SALAD	103	.49	.030		
51	38050	FR. FRIED POT.	112	.77	.066		
51	46130	STRAW+Y PARFAIT	57	.21	.013		
51	49120	APPLE PIE	58	.22	.012		
51	59000	COFFEE	92	.76	.048		
51	59100	MILK ^{GLASS}	35	.09	.006		
51	63000	ROLLS BUTTER	144	.77	.064		
52	HEADER 111870	157	930.00	157.87	+1.663	159	12
52	12070	PEAR ^{PROSC} HAM	35	.27	.019		
52	15050	MARINATED HERRIN	61	.34	.031		
52	25010	LAMB, ROAST LEG	47	.38	.023		
52	25020	BEEF STROGANOFF	51	.25	.023		
52	25030	CLAMS ^{FRIED}	52	.33	.029		
52	38010	TOSSED GR SALAD	114	.60	.045		
52	38020	BAK STUFF POTATO	105	.71	.057		
52	42010	CHOC PARFAIT	25	.36	.029		
52	49020	ORANGE CHIF PIE	29	.35	.029		
52	59000	COFFEE	99	.59	.045		
52	59100	MILK ^{GLASS}	39	.16	.004		
52	63000	ROLLS BUTTER	111	.81	.055		
53	HEADER 123070	146	691.00	147.43	+2.470	148	12
53	12060	MINTED FRUIT CUP	31	.23	.007		
53	15030	CHERRYSTONES	39	.36	.086		
53	25070	PR RIBS OF BEEF	61	.29	.013		
53	25080	BR. VEAL CUTLET	52	.31	.013		
53	25110	FILLET OF SOLE	38	.35	.010		
53	38010	TOSSED GR SALAD	62	.75	.038		
53	38040	AU GRATIN POTATO	96	.69	.035		
53	46060	C D MENTH PARFAI	37	.18	.016		
53	49050	PEACH TART	25	.17	.002		
53	59000	COFFEE	76	.64	.036		

53	59100	MILK#GLASS	50	.24	.017		
53	63000	ROLLS BUTTER	113	.70	.037		
54	HEADER	122370 140	801.00	151.80	+1.357	150	12
54	12080	TOMATO JUICE CT	54	.22	.012		
54	15010	BLUEPOINTS#H SHL	40	.22	.009		
54	25050	ROAST TURKEY	47	.30	.008		
54	25060	BR LIVE LOBSTER	27	.23	.010		
54	25190	BEEF POT PIE	60	.40	.011		
54	38010	TOSSED GR SALAD	62	.48	.028		
54	38050	FR. FRIED POT.	88	.67	.039		
54	46040	BLUEBRY PARFAIT	23	.22	.006		
54	49030	RHUBARB PIE	44	.13	+.003		
54	59000	COFFEE	111	.53	.028		
54	59100	MILK#GLASS	33	.29	.010		
54	63000	ROLLS BUTTER	128	.77	.036		
55	HEADER	121670 150	763.00	152.85	+1.534	152	12
55	12040	CRANBERRY SHRUB	50	.39	.023		
55	15030	CHERRYSTONES	44	.23	.017		
55	25040	BEEF JARDINIERE	44	.43	.017		
55	25100	SIRLOIN STRIP#12	38	.44	.024		
55	25110	FILLET OF SOLE	64	.20	.004		
55	38010	TOSSED GR SALAD	99	.41	.020		
55	38020	BAK STUFF POTATO	71	.58	.014		
55	42010	CHOC PARFAIT	42	.11	.005		
55	49070	LEMON CHIF PIE	31	.25	.007		
55	59000	COFFEE	100	.69	.041		
55	59100	MILK#GLASS	43	.20	.014		
55	63000	ROLLS BUTTER	129	.78	.043		
56	HEADER	120970 150	684.00	154.53	+1.450	155	12
56	12060	MINTED FRUIT CUP	48	.26	.011		
56	14020	CELERY#BLEU CH	59	.35	.017		
56	25150	TENDERLOIN TIPS	51	.28	.020		
56	25160	BR. LAMB CHOPS	68	.26	.021		
56	25170	CHIX ALA MARYLND	42	.46	.028		
56	38010	TOSSED GR SALAD	127	.69	.033		
56	38040	AU GRATIN POTATO	94	.49	.031		
56	46060	C D MENTH PARFAI	20	.27	.009		
56	49110	APRICOT PIE	58	.17	.007		
56	59000	COFFEE	104	.58	.024		
56	59100	MILK#GLASS	31	.28	.020		
56	63000	ROLLS BUTTER	132	.81	.038		
57	HEADER	120270 151	861.00	156.61	+1.084	156	12
57	12040	CRANBERRY SHRUB	46	.40	.037		
57	15010	BLUEPOINTS#H SHL	56	.31	.022		
57	25120	SWEDISH STEAK	78	.28	.022		
57	25130	BA STUFF SHRIMP	23	.42	.035		
57	25140	CHIX POT PIE	52	.28	.024		
57	38010	TOSSED GR SALAD	78	.78	.054		
57	38030	HASH BR POTATO	119	.55	.037		
57	42010	CHOC PARFAIT	38	.19	.012		
57	49090	BLUEBERRY TART	40	.36	.034		

57	59000	COFFEE	119	.64	.049		
57	59100	MILK+GLASS	18	.23	.024		
57	63000	ROLLS BUTTER	113	.82	.068		
61	HEADER	120370 154	976.00	160.65	+1.545	161	12
61	12080	TOMATO JUICE CT	84	.32	.028		
61	15090	SHRIMP COCKTAIL	62	.37	.023		
61	25180	FILET MIGNON	35	.47	.037		
61	25190	BEEF POT PIE	78	.19	.009		
61	25200	HALF BR. CHIX	40	.28	.021		
61	38010	TOSSED GR SALAD	116	.57	.043		
61	38050	FR. FRIED POT.	85	.59	.039		
61	46130	STRAWBY PARFAIT	29	.29	.023		
61	49120	APPLE PIE	35	.22	.025		
61	59000	COFFEE	98	.57	.048		
61	59100	MILK+GLASS	37	.26	.011		
61	63000	ROLLS BUTTER	128	.74	.052		
62	HEADER	112670 157	816.00	162.80	+1.192	162	12
62	12070	PEAR+PROSC HAM	36	.48	.037		
62	15050	MARINATED HERRIN	60	.39	.025		
62	25010	LAMB, ROAST LEG	18	.23	.021		
62	25020	BEEF STROGANOFF	75	.49	.032		
62	25030	CLAMS+FRIED	60	.24	.015		
62	38010	TOSSED GR SALAD	86	.78	.058		
62	38020	BAK STUFF POTATO	128	.55	.043		
62	42010	CHOC PARFAIT	22	.17	.007		
62	49020	ORANGE CHIF PIE	31	.13	.005		
62	59000	COFFEE	90	.63	.050		
62	59100	MILK+GLASS	57	.17	.006		
62	63000	ROLLS BUTTER	125	.79	.067		
63	HEADER	111970 161	787.00	163.86	+1.271	164	12
63	12060	MINTED FRUIT CUP	33	.20	.013		
63	15030	CHERRYSTONES	54	.35	.032		
63	25070	PR RIBS OF BEEF	62	.13	.012		
63	25080	BR. VEAL CUTLET	55	.43	.031		
63	25110	FILLET OF SOLE	45	.35	.019		
63	38010	TOSSED GR SALAD	78	.50	.035		
63	38040	AU GRATIN POTATO	107	.80	.061		
63	46060	C D MENTH PARFAI	36	.25	.029		
63	49050	PEACH TART	34	.14	.006		
63	59000	COFFEE	97	.49	.035		
63	59100	MILK+GLASS	31	.34	.018		
63	63000	ROLLS BUTTER	22	.72	.057		
64	HEADER	123170 147	703.00	151.45	+1.979	149	12
64	12080	TOMATO JUICE CT	58	.18	.011		
64	15010	BLUEPOINTS+H SHL	42	.32	.018		
64	25050	ROAST TURKEY	56	.35	.017		
64	25060	BR LIVE LOBSTER	42	.23	.020		
64	25190	BEEF POT PIE	54	.38	.013		
64	38010	TOSSED GR SALAD	92	.46	.025		
64	38050	FR. FRIED POT.	94	.63	.034		
64	46040	BLUEBRY PARFAIT	25	.22	.011		

64	49030	RHUBARB PIE	37	.21	.013				
64	59000	COFFEE	109	.61	.024				
64	59100	MILKGLASS	32	.17	.009				
64	63000	ROLLS BUTTER	126	.73	.040				
65	HEADER	122470 149	787.00	152.88	+2.298	151	12		
65	12040	CRANBERRY SHRUB	29	.39	.019				
65	15030	CHERRYSTONES	60	.27	.023				
65	25040	BEEF JARDINIERE	33	.36	.020				
65	25100	SIRLOIN STRIP#12	43	.35	.019				
65	25110	FILLET OF SOLE	69	.28	.018				
65	38010	TOSSED GR SALAD	110	.63	.039				
65	38020	BAK STUFF POTATO	63	.67	.034				
65	42010	CHOC PARFAIT	57	.16	.009				
65	49070	LEMON CHIF PIE	29	.25	.004				
65	59000	COFFEE	97	.67	.028				
65	59100	MILKGLASS	34	.23	.019				
65	63000	ROLLS BUTTER	124	.82	.043				
66	HEADER	121770 149	824.00	155.16	+2.309	155	12		
66	12060	MINTED FRUIT CUP	56	.40	.010				
66	14020	CELERY#BLEU CH	30	.23	.015				
66	25150	TENDERLOIN TIPS	33	.25	.005				
66	25160	BR. LAMB CHOPS	76	.23	.011				
66	25170	CHIX ALA MARYLND	35	.50	.028				
66	38010	TOSSED GR SALAD	62	.68	.034				
66	38040	AU GRATIN POTATO	123	.37	.019				
66	46060	C D MENTH PARFAI	38	.37	.016				
66	49110	APRICOT PIE	44	.15	.013				
66	59000	COFFEE	88	.66	.034				
66	59100	MILKGLASS	51	.26	.012				
66	63000	ROLLS BUTTER	138	.87	.047				
67	HEADER	121070 150	720.00	158.19	+1.884	158	12		
67	12040	CRANBERRY SHRUB	56	.23	.009				
67	15010	BLUEPOINTS#H SHL	69	.35	.014				
67	25120	SWEDISH STEAK	81	.25	.012				
67	25130	BA STUFF SHRIMP	24	.49	.028				
67	25140	CHIX POT PIE	53	.23	.017				
67	38010	TOSSED GR SALAD	86	.44	.026				
67	38030	HASH BR POTATO	90	.75	.029				
67	42010	CHOC PARFAIT	45	.19	.006				
67	49090	BLUEBERRY TART	36	.27	.021				
67	59000	COFFEE	89	.58	.023				
67	59100	MILKGLASS	52	.28	.013				
67	63000	ROLLS BUTTER	124	.87	.051				
	1	3	2	11	3	19	4	27	5
	6	43	11	51	12	155	13	259	14
	15	467	16	571	17	675	21	779	22
	23	987	24	1091	25	1195	26	1299	27
	31	1507	32	1611	33	1715	34	1819	35
	36	2027	37	2131	41	2235	42	2339	43
	44	2547	45	2651	46	2755	47	2859	51
	52	3067	53	3171	54	3275	55	3379	56
	57	3587	61	3691	62	3795	63	3899	64
	65	4107	66	4211	67	4315			

APPENDIX D

RECIPE FILE

64	378			
10	0	BATTER#BREADING	4	48 16
10	55010	EGGS#FRESH WHOL		.1660
10	60010	MILK#HOMOG		.1870
10	95170	PEPPER#BLACK		.0010
10	95230	SALT		.0310
30	0	BLEU CHEESE SPRD	3	48 12
30	61010	CREAM#LIGHT		.0630
30	64020	CHEESE#BLEU		.2000
30	64040	CHEESE#CREAM		1.0000
50	0	BLEU CHEESE DR	6	120 40
50	64020	CHEESE#BLEU		.6000
50	64040	CHEESE#CREAM		1.5000
50	70010	SUGAR#GRAN		.0620
50	95150	PAPRIKA		.0310
50	95270	VINEGAR#WHITE		.0460
50	97100	WATER		1.0000
70	0	BOUQUET GARNI#BG	7	1 1
70	81010	CARROTS#FRESH		.2500
70	81030	CELERY#FRESH		.1250
70	81130	ONIONS#FRESH		.2500
70	81150	PARSLEY#FRESH		.0630
70	95010	BAYLEAF		.0310
70	95250	THYME		.0630
70	95290	WHOLE CLOVES		.0310
90	0	BROWN SAUCE#QTS	10	5 1
90	14020	BUTTER#PRINT		.6250
90	33010	FLOUR#BREAD		.6250
90	81010	CARROTS#FRESH		.5000
90	81030	CELERY#FRESH		.5000
90	81130	ONIONS#FRESH		1.0000
90	90010	BEEF BASE		.0870
90	95010	BAYLEAF		.0100
90	95170	PEPPER#BLACK		.0050
90	95230	SALT		.0100
90	97100	WATER		1.0000
110	0	CHEESE SAUCE#QTS	9	4 1
110	14020	BUTTER#PRINT		.3750
110	30010	BREAD CRUMBS		.3750
110	60010	MILK#HOMOG		.7500
110	64010	CHEESE#AMERICAN		.2000
110	64030	CHEESE#CHEDDAR		.2000
110	92920	WORCESTR SC		.0040
110	95130	MUSTARD#DRY		.0200
110	95150	PAPRIKA		.0200
110	95230	SALT		.0200
130	0	COCKTAIL SAUCE#O	7	4 1
130	23010	LEMONS#FR		1.0000
130	81070	HORSERADISH#FR		.3100
130	92010	TOBASCO		.0040
130	92920	WORCESTR SC		.3100

130	95030	CATSUP			.5000
130	95050	CHILI SAUCE			.3750
130	95230	SALT			.0330
150	0	CREAM SAUCE	QTS	4 4	1
150	14020	BUTTER	PRINT		.5000
150	33010	FLOUR	BREAD		.5000
150	60010	MILK	HOMOG		1.0000
150	95230	SALT			.0100
170	0	FRENCH DRESSING		8 120	40
170	12020	OIL	SALAD		.6880
170	70010	SUGAR	GRAN		.7500
170	81130	ONIONS	FRESH		.2500
170	95150	PAPRIKA			.2500
170	95230	SALT			.2750
170	95270	VINEGAR	WHITE		.2340
170	97010	CORNSTARCH			.1860
170	97100	WATER			1.0000
190	0	OIL	VINEGAR DR	4 120	40
190	12010	OIL	OLIVE		.7500
190	95170	PEPPER	BLACK		.0620
190	95230	SALT			.0660
190	95270	VINEGAR	WHITE		.2500
210	0	ONIONS	SAUTEED	4 5	1
210	14020	BUTTER	PRINT		.2500
210	81130	ONIONS	FRESH		5.0000
210	95150	PAPRIKA			.1250
210	95230	SALT			.0310
230	0	PIE CRUST	LB	4 6	1
230	10010	SHORTENING	HYDR		2.0000
230	33010	FLOUR	BREAD		3.0000
230	95230	SALT			.0310
230	97100	WATER			1.0000
250	0	STUFFING	CRACK	3 8	1
250	14020	BUTTER	PRINT		2.0000
250	35010	CRACKERS	RITZ		5.0000
250	58040	SCALLOPS			1.0000
270	0	TOMATO SAUCE	QTS	13 5	1
270	14020	BUTTER	PRINT		.7500
270	33010	FLOUR	BREAD		.3750
270	80190	TOMATOE	PUREE		.6400
270	81030	CELERY	FRESH		.5000
270	81130	ONIONS	FRESH		1.0000
270	90010	BEEF BASE			.0470
270	95010	BAYLEAF			.0200
270	95090	GARLIC POWDER			.0100
270	95190	PEPPERCORNS			.0100
270	95230	SALT			.0100
270	95250	THYME			.0100
270	95290	WHOLE CLOVES			.0100
270	97100	WATER			1.0000
290	0	VELOUTE	SC	5 4	1

290	14020	BUTTER▯PRINT		.6250
290	33010	FLOUR▯BREAD		.6250
290	60010	MILK▯HOMOG		.2500
290	90020	CHIX BASE		.2500
290	97100	WATER		1.0000
310	0	CUSTARD PUDD▯QT	6	1 1
310	14020	BUTTER▯PRINT		.0310
310	55010	EGGS▯FRESH WHOL		.3330
310	60010	MILK▯HOMOG		.2500
310	70010	SUGAR▯GRAN		.5000
310	95260	VANILLA		.0310
310	97010	CORNSTARCH		.0940
330	0	STUFFING▯CHIX▯LB	7	2 1
330	14020	BUTTER▯PRINT		.2500
330	30010	BREAD CRUMBS		1.0000
330	55010	EGGS▯FRESH WHOL		.0870
330	81030	CELERY▯FRESH		.5000
330	81130	ONIONS▯FRESH		.5000
330	95170	PEPPER▯BLACK		.0140
330	95230	SALT		.0310
12040	.40	CRANBERRY SHRUB	2	1 1
12040	21010	CRANBERRY JUICE		.0310
12040	63010	SHERBET▯LIME		.0160
12060	.60	MINTED FRUIT CUP	5	1 1
12060	23020	MELON BALLS▯FR		.0150
12060	23030	MIXED FRUITS▯FR		.0125
12060	23050	STRAWBERRIES▯FR		.0290
12060	63010	SHERBET▯LIME		.0160
12060	81110	MINT▯FRESH		.0100
12070	1.00	PEAR▯PROSC HAM	3	1 1
12070	23040	PEARS▯FR		1.0000
12070	51020	HAM▯PROSCIUTTO		.0620
12070	81090	LETTUCE▯ICEBERG		.0750
12080	.40	TOMATO JUICE CT	3	1 1
12080	23010	LEMONS▯FR		.1250
12080	35010	CRACKERS▯RITZ		.0300
12080	80170	TOMATO JUICE▯46		.1300
14020	.50	CELERY▯BLEU CH	4	1 1
14020	30	BLEU CHEESE SPRD		.0210
14020	80130	PIMENTOS		.0010
14020	81030	CELERY▯FRESH		.2000
14020	81090	LETTUCE▯ICEBERG		.1000
15010	1.50	BLUEPOINTS▯H SHL	4	1 1
15010	130	COCKTAIL SAUCE▯Q		.0080
15010	23010	LEMONS▯FR		.2500
15010	58030	OYSTERS▯BLPTS		.0400
15010	81070	HORSE RADISH▯FR		.0040
15030	1.50	CHERRY STONES	4	1 1
15030	130	COCKTAIL SAUCE▯Q		.0120
15030	23010	LEMONS▯FR		.2500
15030	58010	CLANS▯CH. STONE		.0909

15030	81070	HORSERADISH#FR			.0040
15050	.75	MARINATED HERRIN	4	1	1
15050	57010	HERRING#MARINAT			.1870
15050	61020	CREAM#SOUR			.0620
15050	81090	LETTUCE#ICEBERG			.1500
15050	81150	PARSLEY#FRESH			.0400
15090	1.25	SHRIMP COCKTAIL	4	1	1
15090	130	COCKTAIL SAUCE#Q			.0160
15090	23010	LEMONS#FR			.2500
15090	58050	SHRIMP#FROZ#5LB			.2500
15090	81090	LETTUCE#ICEBERG			.1000
25010	3.50	LAMB, ROAST LEG	9	48	12
25010	33010	FLOUR#BREAD			.7500
25010	53020	ALAMB#LEG		28	.0000
25010	72010	JELLY#MINT			.0310
25010	95090	GARLIC POWDER			.0050
25010	95110	MARJORAM			.0100
25010	95170	PEPPER#BHACK			.0310
25010	95230	SALT			.0930
25010	95250	THYME			.0100
25010	97100	WATER			1.0000
25020	4.00	BEEF STROGANOFF	8	48	4
25020	90	BROWN SAUCE#QTS			.6000
25020	14020	BUTTER#PRINT			.3750
25020	34010	NOODLES#EGG			5.0000
25020	50060	BEEF#TEND TIP			.1200
25020	61020	CREAM#SOUR			1.5000
25020	80070	MUSHROOMS#SLICE			.2140
25020	95270	VINEGAR#WHITE			.1250
25020	96050	WINE#WHITE			.3500
25030	3.25	CLAMS#FRIED	6	60	3
25030	30010	BREAD CRUMBS			7.0000
25030	33010	FLOUR#BREAD			2.0000
25030	55010	EGGS#FRESH WHOL			.5000
25030	58020	CLAMS#FRYING			20.0000
25030	60010	MILK#HOMOG			.2500
25030	95230	SALT			.0310
25040	4.00	BEEF JARDINIERE	11	50	5
25040	12020	OIL#SALAD			.2500
25040	33010	FLOUR#BREAD			1.0000
25040	50010	BEEF#BOTTOM RND			22.0000
25040	80210	TOMATOES#WHOLE			1.0000
25040	81010	CARROTS#FRESH			.5000
25040	81030	CELERY#FRESH			.5000
25040	81130	ONIONS#FRESH			1.0000
25040	90010	BEEF BASE			.0780
25040	95010	BAYLEAF			.0100
25040	95250	THYME			.0050
25040	97100	WATER			1.0000
25050	3.75	ROAST TURKEY	12	35	35
25050	330	STUFFING#CHIX#L			4.3750

25050	12020	OIL#SALAD			.0940
25050	20030	CRANBERRY SAUCE			.5000
25050	33010	FLOUR#BREAD			.3750
25050	56020	TURKEY#WHOLE		25.0000	
25050	81010	CARROTS#FRESH			.2500
25050	81030	CELERY#FRESH			.2500
25050	81130	ONIONS#FRESH			.2500
25050	90020	CHIX BASE			.0630
25050	95170	PEPPER#BLACK			.0630
25050	95230	SALT			.1250
25050	97100	WATER			1.0000
25060	5.95	BR LIVE LOBSTER	3	1	1
25060	14020	BUTTER#PRINT			.1870
25060	23010	LEMONS#FR			.2500
25060	58025	LOBSTER#LIVE#1.			1.7500
25070	4.95	PR RIBS OF BEEF	5	20	1
25070	50030	BEEF#RIBS			20.0000
25070	90010	BEEF BASE			.0310
25070	95170	PEPPER#BLACK			.1250
25070	95230	SALT			.1250
25070	97100	WATER			1.0000
25080	4.50	BR. VEAL CUTLET	3	1	1
25080	10	BATTER#BREADING			.0200
25080	30010	BREAD CRUMBS			.0620
25080	52010	VEAL#CUTLET#5			.2500
25100	4.95	SIRLOIN STRIP#12	2	1	1
25100	50050	BEEF#SIR STP#12			.7500
25100	80050	MUSHROOMS#CAPS			.0260
25110	3.25	FILLET OF SOLE	7	48	8
25110	30010	BREAD CRUMBS			5.0000
25110	33010	FLOUR#BREAD			2.0000
25110	55010	EGGS#FRESH WHOL			.5000
25110	58060	SOLE#FILET			20.0000
25110	60010	MILK#HOMOG			.2500
25110	95170	PEPPER#BLACK			.0100
25110	95230	SALT			.0310
25120	4.25	SWEDISH STEAK	3	1	1
25120	210	ONIONS#SAUTEED#L			.0375
25120	12020	OIL#SALAD			.0312
25120	50040	BEEF#SIR STP#8			.5000
25130	4.50	BA STUFF SHRIMP	3	1	1
25130	250	STUFFING#CRACK#L			.0630
25130	23010	LEMONS#FR			.2500
25130	58050	SHRIMP#FROZ#5LB			.2000
25140	3.00	CHIX POT PIE	8	1	1
25140	230	PIE CRUST#LB			.0210
25140	290	VELOUTE SC#QTS			.0470
25140	56005	CHIX#FOWL			.5700
25140	80010	CARROTS#SLICED			.0670
25140	80050	MUSHROOMS#CAPS			.0030
25140	80090	ONIONS#PEARL			.0130

25140	80110	PEAS#GREEN			.0020
25140	80150	POTATOES#PARISN			.0130
25150	4.00	TENDERLOIN TIPS	6	48	1
25150	90	BROWN SAUCE#QTS			1.2000
25150	12020	OIL#SALAD			.5000
25150	14020	BUTTER#PRINT			.1870
25150	50060	BEEF#TEND TIP		17	.0000
25150	80070	MUSHROOMS#SLICE			.4290
25150	96010	WINE#BURGUNDY			.2500
25160	4.95	BR. LAMB CHOPS	3	1	1
25160	53010	LAMB#CHOPS			.7500
25160	72010	JELLY#MINT			.0310
25160	81090	LETTUCE#ICEBERG			.0310
25170	3.50	CHIX ALA MARYLND	11	50	2
25170	150	CREAM SAUCE#QTS			1.0000
25170	270	TOMATO SAUCE#QT			.8000
25170	12020	OIL#SALAD			1.0000
25170	30010	BREAD CRUMBS			2.0000
25170	33010	FLOUR#BREAD			2.0000
25170	51010	BACON#SLICED			3.5000
25170	55010	EGGS#FRESH WHOL			.5000
25170	56010	CHIX#FRYER#2.5		62	.5000
25170	60010	MILK#HOMOG			.2500
25170	95170	PEPPER#BLACK			.0100
25170	95230	SALT			.0100
25180	5.25	FILET MIGNON	2	1	1
25180	14020	BUTTER#PRINT			.0620
25180	50020	BEEF#FILET			.6250
25190	3.25	BEEF POT PIE	13	48	12
25190	70	BOUQUET GARNI#B			1.0000
25190	230	PIE CRUST#LB			1.1660
25190	12020	OIL#SALAD			.7500
25190	33010	FLOUR#BREAD			1.0000
25190	50010	BEEF#BOTTOM RND		17	.0000
25190	80030	CARROTS#WHOLE			1.0000
25190	80090	ONIONS#PEARL			1.0000
25190	80150	POTATOES#PARISN			1.0000
25190	80190	TOMATOE PUREE			.1070
25190	83010	PEAS#FROZ.			2.5000
25190	90010	BEEF BASE			.1090
25190	95230	SALT			.0620
25190	97100	WATER			1.0000
25200	3.50	HALF BR. CHIX	4	50	2
25200	12020	OIL#SALAD			.2500
25200	14020	BUTTER#PRINT			1.0000
25200	56010	CHIX#FRYER#2.5		25	.0000
25200	95230	SALT			.0310
38010	0	TOSSED GR SALAD	8	120	8
38010	50	BLEU CHEESE DR			.3330
38010	170	FRENCH DRESSING			.3330
38010	190	OIL VINEGAR DR			.3330

38010	81030	CELERY#FRESH	7.5000
38010	81050	CUKES	6.0000
38010	81090	LETTUCE#ICEBERG	15.0000
38010	81170	PEPPERS#GREEN	2.0000
38010	81190	RADISHES	3.6660
38020	.30	BAK STUFF POTATO	8 50 1
38020	14020	BUTTER#PRINT	.5000
38020	55010	EGGS#FRESH WHOL	.4160
38020	60010	MILK#HOMOG	.3750
38020	64050	CHEESE#PARMESAN	.5000
38020	82010	POTATOES#BAKERS	50.0000
38020	95150	PAPRIKA	.0200
38020	95170	PEPPER#BLACK	.0100
38020	95230	SALT	.0620
38030	.30	HASH BR POTATO	4 48 4
38030	12020	OIL#SALAD	.5000
38030	82050	POTATOES#MAINE	14.0000
38030	95170	PEPPER#BLACK	.0200
38030	95230	SALT	.0930
38040	.30	AU GRATIN POTATO	5 48 12
38040	110	CHEESE SAUCE#QTS	1.5000
38040	14020	BUTTER#PRINT	.1250
38040	30010	BREAD CRUMBS	.1250
38040	82050	POTATOES#MAINE	1.0000
38040	95150	PAPRIKA	.0312
38050	.30	FR. FRIED POT.	1 20 4
38050	82030	POTATOES#FR#FR	1.0000
42010	.40	CHOC PARFAIT	4 1 1
42010	20010	CHERRIES#BLACK	.0030
42010	61040	CREAM#WHIPPING	.0160
42010	62010	ICE CREAM#VANIL	.0310
42010	76010	CHOCOLATE SAUCE	.0130
46040	.40	BLUEBRY PARFAIT	4 1 1
46040	20010	CHERRIES#BLACK	.0030
46040	61040	CREAM#WHIPPING	.0160
46040	62010	ICE CREAM#VANIL	.0310
46040	73010	BLUEBERRY FILLI	.0130
46060	.50	C D MENTH PARFAI	2 1 1
46060	62010	ICE CREAM#VANIL	.0310
46060	78010	CR. DE MENTHE#G	.0600
46130	.40	STRAWBY PARFAIT	4 1 1
46130	20010	CHERRIES#BLACK	.0030
46130	61040	CREAM#WHIPPING	.0160
46130	62010	ICE CREAM#VANIL	.0310
46130	73030	STRAWBERRY TOPN	.0130
49020	.50	ORANGE CHIF PIE	1 1 1
49020	93070	PIE#ORANGE CHIF	.1660
49030	.50	RHUBARB PIE	1 1 1
49030	93080	PIE#RHUBARB	.1660
49050	.40	PEACH TART	4 1 1
49050	310	CUSTARD PUDD#QT	.0470

APPENDIX E

INGREDIENT FILE

119	119								
10010	SHORTENING	HYD	6.75	LB	25	25.00	LB	50.00	2
12010	OIL	OLIVE	.85	QT		1.00	QT	6.00	1
12020	OIL	SALAD	6.00	CS	12	12.00	QT	23.00	1
14010	BUTTER	CHIP	18.00	LB	30	6.00	LB	7.00	3
14020	BUTTER	PRINT	12.50	LB	24	24.00	LB	32.00	3
20010	CHERRIES	BLACK	8.25	CS	6	6.00	C10	9.00	1
20030	CRANBERRY	SAUCE	9.00	CS	6	6.00	C10	12.00	1
21010	CRANBERRY	JUICE	4.50	GAL	4	4.00	GAL	8.00	1
23010	LEMONS	FR	4.25	CS	110	110.00	EA	110.00	4
23020	MELON	BALLS	3.00	GAL		1.00	GAL	3.00	4
23030	MIXED	FRUITS	2.00	GAL		1.00	GAL	2.00	4
23040	PEARS	FR	.07	EA		1.00	EA	30.00	4
23050	STRAWBERRIES	FR	.35	QT		1.00	QT	8.00	4
30010	BREAD	CRUMBS	.50	LB	5	5.00	LB	6.00	1
30020	BREAD	WHITE	.30	LOAF		1.00	LOAF	45.00	1
31010	ROLLS	BR	.40	DOZ		1.00	DOZ	10.00	5
33010	FLOUR	BREAD	2.50	LB	25	25.00	LB	150.00	1
34010	NOODLES	EGG	2.75	LB	10	10.00	LB	20.00	1
35010	CRACKERS	RITZ	2.25	LB	5	5.00	LB	8.00	1
50010	BEEF	BOTTOM RND	1.15	LB		1.00	LB	70.00	2
50020	BEEF	FILET	1.70	LB		1.00	LB	18.00	2
50030	BEEF	RIBS	1.45	LB		1.00	LB	80.00	2
50040	BEEF	SIR STP	1.55	LB	8	1.00	LB	20.00	2
50050	BEEF	SIR STP	1.55	LB	12	1.00	LB	30.00	2
50060	BEEF	TEND TIP	1.30	LB		1.00	LB	25.00	2
51010	BACON	SLICED	.85	LB		1.00	LB	24.00	2
51020	HAM	PROSCIUTTO	2.20	LB		1.00	LB	8.00	2
52010	VEAL	CUTLET	1.45	LB	5	1.00	LB	22.00	2
53010	LAMB	CHOPS	1.20	LB		1.00	LB	40.00	2
53020	LAMB	LEG	.95	LB		1.00	LB	40.00	2
55010	EGGS	FRESH WHOLE	.60	DOZ		1.00	DOZ	28.00	3
56005	CHIX	FOWL	.45	LB		1.00	LB	42.00	2
56010	CHIX	FRYER	.40	LB	2.5	1.00	LB	60.00	2
56020	TURKEY	WHOLE	.55	LB		1.00	LB	72.00	2
57010	HERRING	MARINATE	.75	LB		1.00	LB	6.00	2
57020	SOLE	FILET	.06	LB	FRESH	1.00	LB	18.00	2
58010	CLAMS	CH. STONE	1.25	PECK		1.00	PECK	3.00	2
58020	CLAMS	FRYING	.75	LB		1.00	LB	6.00	2
58025	LOBSTER	LIVE	1.35	LB	1.7	1.00	LB	35.00	2
58030	OYSTERS	BLPTS	2.00	PECK		1.00	PECK	6.00	2
58040	SCALLOPS		1.05	LB		1.00	LB	10.00	2
58050	SHRIMP	FROZ	1.55	LB	5LB	1.00	LB	15.00	5
58060	SOLE	FILET	.65	LB		1.00	LB	25.00	2
60010	MILK	HOMO	4.55	GAL	5	5.00	GAL	7.00	3
61010	CREAM	LIGHT	.55	QT		1.00	QT	16.00	3
61020	CREAM	SSUR	.35	PT		1.00	PT	4.00	3
61030	CREAM	TOPPING	.40	CAN		1.00	CAN	4.00	3
61040	CREAM	WHIPPING	.75	QT		1.00	QT	3.00	3
62010	ICE	CREAM	1.70	GAL	VANILL	1.00	GAL	10.00	5
63010	SHERBET	LINE	.85	GAL		1.00	GAL	4.00	5

64010	CHEESE#AMERICAN	3.00	LB#5	1.00	LB#5	2.00	3
64020	CHEESE#BLEU	8.75	LB#5	1.00	LB#5	3.00	3
64030	CHEESE#CHEDDAR	4.75	LB#5	1.00	LB#5	3.00	3
64040	CHEESE#CREAM	.85	LB	1.00	LB	3.00	3
64050	CHEESE#PARMESAN	.75	LB	1.00	LB	3.00	3
70010	SUGAR#GRAN	2.75	LB#25	25.00	LB	200.00	1
72010	JELLY#MINT	1.20	QT	1.00	QT	6.00	1
73010	BLUEBERRY FILLIN	10.40	CS#6	6.00	C10	5.00	1
73020	PEACH TOPPING	10.40	CS#6	6.00	C10	3.00	1
73030	STRAWBERRY TOPNG	13.50	CS#6	6.00	C10	3.00	1
76010	CHOCOLATE SAUCE	6.00	CS#6	6.00	C10	9.00	1
78010	CR. DE MENTHE#GR	3.50	FTH	1.00	FTH	3.00	1
80010	CARROTS#SLICED	6.60	CS#6	6.00	C10	12.00	1
80030	CARROTS#WHOLE	6.00	CS#6	6.00	C10	11.00	1
80050	MUSHROOMS#CAPS	21.00	CS#6	6.00	C10	10.00	1
80070	MUSHROOMS#SLICED	15.00	CS#6	6.00	C10	9.00	1
80090	ONIONS#PEARL	9.25	CS#6	6.00	C10	7.00	1
80110	PEAS#GREEN	5.20	CS#6	6.00	C10	11.00	1
80130	PIMENTOS	7.25	CS#6	6.00	C10	8.00	1
80150	POTATOES#PARISH	12.00	CS#6	6.00	C10	20.00	1
80170	TOMATO JUICE#460	4.70	CS#12	12.00	C5C	35.00	1
80190	TOMATO PUREE	6.00	CS#6	6.00	C10	20.00	1
80210	TOMATOES#WHOLE	4.80	CS#6	6.00	C10	18.00	1
81010	CARROTS#FRESH	.25	LB	1.00	LB	20.00	4
81030	CELERY#FRESH	5.75	LB#70	70.00	LB	60.00	4
81050	CUKES	2.85	LB#10	10.00	LB	8.00	4
81070	HORSERADISH#FR	2.00	GAL	1.00	GAL	3.00	4
81090	LETTUCE#ICEBERG	7.50	LB#50	50.00	LB	75.00	4
81110	MINT#FRESH	.20	BNCH	1.00	BNCH	8.00	4
81130	ONIONS#FRESH	2.50	LB#50	50.00	LB	46.00	1
81150	PARSLEY#FRESH	.15	BNCH	1.00	BNCH	3.00	4
81170	PEPPERS#GREEN	.16	LB	1.00	LB	6.00	4
81190	RADISHES	.08	BNCH	1.00	BNCH	12.00	4
82010	POTATOES#BAKERS	3.75	BX#90	90.00	EA.	120.00	1
82030	POTATOES#FRF#FRZ	.60	LB#5	1.00	LB#5	8.00	5
82050	POTATOES#MAINE	2.00	LB#50	50.00	LB	300.00	1
83010	PEAS#FROZ.	.85	LB#2.5	2.50	LB	15.00	5
90010	BEEF BASE	2.25	LB	1.00	LB	6.00	2
90020	CHIX BASE	2.25	LB	1.00	LB	8.00	2
91010	COFFEE	10.75	LB#12	12.00	LB	30.00	1
92010	TOBASCO	4.80	CS#12	12.00	EA.	24.00	1
92920	WORCESTR SC	5.75	GAL#4	4.00	GAL	3.00	1
93010	PIE#APPLE	.95	EA.	1.00	EA.	15.00	5
93030	PIE#APRICOT	.95	EA.	1.00	EA.	10.00	5
93050	PIE#LEMON CHIFF	.95	EA.	1.00	EA.	12.00	5
93070	PIE#ORANGE CHIFF	.95	EA.	1.00	EA.	14.00	5
93080	PIE#RHUBARB	.95	EA.	1.00	EA.	8.00	5
93100	TART SHELLS	4.25	DOZ#3	3.00	DOZ	10.00	5
95010	BAYLEAF	1.00	LB	1.00	LB	2.00	1
95030	CATSUP	6.00	CS#6	6.00	C10	9.00	1
95050	CHILI SAUCE	6.60	CS#6	6.00	C10	5.00	1

95070	COCKTAIL SAUCE	7.20	CS.6	6.00	C10	3.00	1		
95090	GARLIC POWDER	1.80	LB	1.00	LB	2.00	1		
95110	MARJORAM	.65	LB	1.00	LB	1.00	1		
95130	MUSTARD DRY	1.25	LB	1.00	LB	2.00	1		
95150	PAPRIKA	1.35	LB	1.00	LB	3.00	1		
95170	PEPPER BLACK	1.00	LB	1.00	LB	6.00	1		
95190	PEPPERCORNS	1.20	LB	1.00	LB	3.00	1		
95200	POULT. SEASONING	1.20	LB	1.00	LB	4.00	1		
95210	SAGE	.65	LB	1.00	LB	2.00	1		
95230	SALT	1.50	LB 5	5.00	LB	30.00	1		
95250	THYME	.75	LB	1.00	LB	1.00	1		
95260	VANILLA	3.00	PT	1.00	PT	3.00	1		
95270	VINEGAR WHITE	2.40	GAL 4	4.00	GAL	9.00	1		
95290	WHOLE CLOVES	1.50	LB	1.00	LB	3.00	1		
96010	WINE BURGUNDY	.95	FTH	1.00	FTH	6.00	1		
96050	WINE WHITE	.95	FTH	1.00	FTH	8.00	1		
97010	CORNSEARCH	4.50	CS 24	24.00	LB	24.00	1		
97100	WATER	0	XX	0	XX	0	0		
10010	3	12010	12	12020	21	14010	30	14020	39
20010	48	20030	57	21010	66	23010	75	23020	84
23030	93	23040	102	23050	111	30010	120	30020	129
31010	138	33010	147	34010	156	35010	165	50010	174
50020	183	50030	192	50040	201	50050	210	50060	219
51010	228	51020	237	52010	246	53010	255	53020	264
55010	273	56005	282	56010	291	56020	300	57010	309
57020	318	58010	327	58020	336	58025	345	58030	354
58040	363	58050	372	58060	381	60010	390	61010	399
61020	408	61030	417	61040	426	62010	435	63010	444
64010	453	64020	462	64030	471	64040	480	64050	489
70010	498	72010	507	73010	516	73020	525	73030	534
76010	543	78010	552	80010	561	80030	570	80050	579
80070	588	80090	597	80110	606	80130	615	80150	624
80170	633	80190	642	80210	651	81010	660	81030	669
81050	678	81070	687	81090	696	81110	705	81130	714
81150	723	81170	732	81190	741	82010	750	82030	759
82050	768	83010	777	90010	786	90020	795	91010	804
92010	813	92920	822	93010	831	93030	840	93050	849
93070	858	93080	867	93100	876	95010	885	95030	894
95050	903	95070	912	95090	921	95110	930	95130	939
95150	948	95170	957	95190	966	95200	975	95210	984
95230	993	95250	1002	95260	1011	95270	1020	95290	1029
96010	1038	96050	1047	97010	1056	97100	1065		

APPENDIX F

INPUT TO FILPRO1

EXECUTE FILPRO1

16K

FILE NAMES(BANQUET, RECIPE, MENU)

?BANQ RECIPES MENUS

BANQ IS CURRENTLY EMPTY--STOP OR RETURN

DATE ?10171

TYPE AND CODE ?MENU 15

TOTAL COVERS AND SALES ?150 600.00

RECIPE COVERS

CRANBERRY SHRUB ?35

CHERRYSTONES ?73

BEEF JARDINIÈRE ?45

SIRLOIN STRIP/12 ?64

FILLET OF SOLE ?41

TOSSED GR SALAD ?143

BAK STUFF POTATO ?112

CHOC PARFAIT ?40

LEMON CHIFFON PIE?56

COFFEE ?123

MILK/GLASS ?10

ROLLS BUTTER ?132

TYPE AND CODE ?RECIPE 12070

NAME IS PEAR/PROSC HAM CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 0.

TYPE AND CODE ?RECIPE 25070

NAME IS PR RIBS OF BEEF CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 5.95

TYPE AND CODE ?RECIPE 38010

NAME IS TOSSED GR SALAD CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 0.

TYPE AND CODE ?RECIPE 38050

NAME IS FR. FRIED POT. CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 0.

TYPE AND CODE ?RECIPE 63000

NAME IS ROLLS BUTTER CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 0.

TYPE AND CODE ?RECIPE 59000

NAME IS COFFEE CORRECT ?YES

CODE, COVERS, PRICE ?SIMMONS 50 0.

TYPE AND CODE ?RECIPE 25050

NAME IS ROAST TURKEY CORRECT ?YES

CODE, COVERS, PRICE ?A 13 X

TYPE AND CODE ?END RUN

APPENDIX G

SAMPLE BANQUET FILE

7	7							
710101	12070	PEAR PROSC HAM	SIMMONS	50	0	0		
710101	25070	PR RIBS OF BEEF	SIMMONS	50	5.95	297.50		
710101	38010	TOSSED GR SALAD	SIMMONS	50	0	0		
710101	38050	FR. FRIED POT.	SIMMONS	50	0	0		
710101	63000	ROLLS BUTTER	SIMMONS	50	0	0		
710101	59000	COFFEE	SIMMONS	50	0	0		
710101	25050	ROAST TURKEY		13	3.75	48.75		
710101	3710101	11710101	19710101	27710101				35
710101	43710101	51						

APPENDIX H

PROGRAM FILPRO2--DIALOGUE AND OUTPUT

EXECUTE FILPRO2
 FILE NAMES, COST AND ING ?COSTF FOODS
 DATE ?10171

CURRENT STATUS

T.SALES	S.REQS.	F.DRCT	TRANSF.	P.COST
1204.00	0	0	0	291.81

STOREROOM PURCHASES ?YES

ING CODE ?14020
 BUTTER■PRINT CORRECT ?YES
 I-I UNITS(LB) ?2.
 COST PER LB/24?12.75

ING CODE ?52010
 VEAL/CUTLET/5 CORRECT ?YES
 I-I UNITS(LB) ?50.
 COST PER LB ?X

ING CODE ?63010
 SHERBET/LIME CORRECT ?YES
 I-I UNITS(GAL) ?5.
 COST PER GAL ? .90

ING CODE ?END

STOREROOM REQUISITIONS ?YES

ING CODE ?12040
 NO SUCH INGREDIENT

ING CODE ?21010
 CRANBERRY JUICE CORRECT ?YES
 I-I UNITS(GAL)?2.

ING CODE ?50010
 BEEF/BOTTOM RND CORRECT ?YES
 I-I UNITS(LB)?52.

ING CODE ?50050
 BEEF/SIR STP/12 CORRECT ?YES
 I-I UNITS(LB)?30.

ING CODE ?82010
 POTATOES/BAKERS CORRECT ?YES
 I-I UNITS(EA.)?120.

Note

Please observe the following about the dialogue on the preceeding page and the computer output on the following page:

1. The current cost file status is given to prevent double posting.
2. The user has the option not to enter issues or purchases if he so chooses.
3. If the purchase price has not changed, user need only enter "X" as price.
4. User has the option to list purchase entries in order to check for errors.
5. User has the option to list issue entries in order to check for errors.
6. User has the option to list inventory entries affected by purchases and ussues, the entire inventory, or can simply obtain summaries of each.

ING CODE ?END

FOOD DIRECT TOTALS AND TRANSFERS TOTALS ?225.0.

PURCHASE LISTING

DETAIL, SUMMARY, BOTH, OR NONE

?BOTH

CODE	NAME	AMOUNT	UNIT	COST
14020	BUTTER/PRINT	2.00	LB/24	25.50
52010	VEAL/CUTLET/5	50.00	LB	72.50
63010	SHERBET/LIME	5.00	GAL	4.50
TOTAL				102.50

REQUISITION LISTING

DETAIL, SUMMARY, BOTH, OR NONE

?BOTH

CODE	NAME	AMOUNT	UNIT	COST
21010	CRANBERRY JUICE	2.00	GAL	2.25
50010	BEEF/BOTTOM RND	52.00	LB	59.80
50050	BEEF/SIR STP/12	30.00	LB	46.50
82010	POTATOES/BAKERS	120.00	EA.	5.00
TOTAL				113.55

EXTENDED INVENTORY LISTING

DETAIL, SUMMARY, BOTH, OR NONE

?BOTH

CODE	NAME	PRICE	ON HAND	I/I	VALUE
14020	BUTTER PRINT	.53	80.00	LB	42.50
21010	CRANBERRY JUICE	1.12	6.00	GAL	6.75
50010	BEEF/BOTTOM RND	1.15	18.00	LB	20.70
50050	BEEF/SIR/STP/12	1.55	0	LB	0
52010	VEAL/CUTLET/5	1.45	92.00	LB	133.40
63010	SHERBET/LIME	.90	9.00	GAL	8.10
82010	POTATOES/BAKERS	.04	0	EA.	0
TOTALS					211.45

APPENDIX I

FORECAST SIMULATION PROGRAMS (TEST)

Total Demand Generator--Uniform Distribution

```

0001  PROGRAM DEMANDS
0010  DIMENSION DAYS(365),DEMAND(365),SMOOTH(365),DL(7),DH(7),
0011A DIF(7),X(10),Y(10),XS(10,10),B(10,1),NPT(4,4),NOPT(5)
0015  DATA ( NPT = 1,3,0,0, 0,0,1,3, 1,0,2,3, 1,3,1,3 )
0016  DATA ( NOPT = 6HSMOOTH, 6HDEMAND, 8HCOMPOSIT, 4HBOTH, 4HNONE
0019  READ, XMIN, XMAX, YMIN, YMAX
0020  READ, NUMD, RANS, NCYCLE, (DL(I),I=1,NCYCLE), (DH(I),I=1,NCYC
0021A NPOINTS, (X(I),I=1,NPOINTS), (Y(I),I=1,NPOINTS)
0023  READ, NSTEP1, NSTEP2, NSTEP3, DEL, DELDEL
0025  CALL RANFSET(RANS)
0030  NDIM = 10
0040  DO 60 LP = 1,NUMD
0050  DAYS(LP) = LP
0060  CONTINUE
0070  DO 90 LP = 1,NCYCLE
0080  DIF(LP) = DH(LP) - DL(LP)
0090  CONTINUE
0095  NSUB1 = NPOINTS
0100  NSUB2 = 1
0110  DO 170 J = 1,NPOINTS
0120  XS(J,1) = 1.0
0130  B(J,1) = Y(J)
0140  DO 160 I = 2,NPOINTS
0150  XS(J,I) = X(J) * XS(J,I-1)
0160  CONTINUE
0170  CONTINUE
0180  CALL MATINV(XS,NSUB1,B,NSUB2,DET,NDIM )
0190  K = 1
0200  DO 290 LP = 1,NUMD
0210  SMOOTH(LP) = 0.0
0220  DO 240 I = 1,NPOINTS
0230  SMOOTH(LP) = SMOOTH(LP) + ( DAYS(LP)**(I-1) ) * B(I,1)
0240  CONTINUE
0250  R = RANF(-1)
0260  DEMAND(LP) = SMOOTH(LP) * ( DL(K) + (DIF(K)*R) )
0264  ND = DEMAND(LP) + .5
0266  DEMAND(LP) = ND
0270  K = K + 1
0280  IF ( K .GT. NCYCLE ) K = 1
0290  CONTINUE
0291  IF ( NSTEP1 .EQ. 0 ) GO TO 300
0292  DO 299 LP1 = NSTEP1,NSTEP2,NSTEP3
0293  NSTEP4 = LP1 + NSTEP3 - 1
0294  IF ( NSTEP4 .GT. NSTEP2 ) NSTEP4 = NSTEP2
0295  DO 297 LP2 = LP1,NSTEP4
0296  DEMAND(LP2) = DEMAND(LP2) + DEL
0297  CONTINUE
0298  DEL = DEL + DELDEL
0299  CONTINUE
0300  PRINT 310
0310  FORMAT ( *-EXAMINE * )

```

```

0320 INPUT, NDEC
0330 IF ( NDEC .NE. 3HYES ) GO TO 410
0340 PRINT 350
0350 FORMAT ( *-INPUT DAY RANGE ( FIRST AND LAST ) * )
0360 INPUT, N1, N2
0370 PRINT 380
0380 FORMAT ( // * DAY SMOOTH DEMAND PCTLOW PCTHIH PCTACT * / 1X )
0390 K = 0
0391 DO 400 LP = 1, N2
0392 K = K + 1
0393 IF ( K .GT. NCYCLE ) K = 1
0394 IF ( LP .LT. N1 ) GO TO 400
0395 PCT = DEMAND(LP)/SMOOTH(LP)
0396 PRINT 397, LP, SMOOTH(LP), DEMAND(LP), DL(K), DH(K), PCT
0397 FORMAT ( 1X, I3, 2(1X, F6.1), 3(1X, F6.3) )
0400 CONTINUE
0410 PRINT 420
0420 FORMAT ( *-PLOT SMOOTH, DEMAND, COMPOSIT, BOTH, OR NONE * )
0430 INPUT, NDEC
0440 IF ( NDEC .EQ. 4HNONE ) GO TO 560
0450 DO 490 LP = 1, 4
0460 IF ( NDEC .NE. NOPT(LP) ) GO TO 490
0470 J = LP
0480 GO TO 510
0490 CONTINUE
0500 GO TO 410
0510 CONTINUE
0520 CALL PLOTTER(DAYS, SMOOTH, NUMD, NPT(1, J), 1HS, XMIN, XMAX, YMIN, YMAX,
0521A 3HDAY, 6HDEMAND )
0530 CALL PLOTTER(X, Y, NPOINTS, NPT(2, J), 1HX, XMIN, XMAX, YMIN, YMAX,
0531A 3HDAY, 6HDEMAND )
0540 CALL PLOTTER(DAYS, DEMAND, NUMD, NPT(3, J), 1HD, XMIN, XMAX, YMIN, YMAX,
0541A 3HDAY, 6HDEMAND )
0550 CALL PLOTTER(X, Y, NPOINTS, NPT(4, J), 1HX, XMIN, XMAX, YMIN, YMAX,
0551A 3HDAY, 6HDEMAND )
0560 PRINT 570
0570 FORMAT ( *-FILE NAME ( INPUT NONE IF NOT TO BE FILED * )
0580 INPUT, NDEC
0590 IF ( NDEC .EQ. 4HNONE ) GO TO 680
0600 CALL OPEN(1, NDEC, -1)
0605 WRITE(1) (DEMAND(I), I=1, NUMD)
0610 CALL CLOSE(1, NDEC)
0680 PRINT 690
0690 FORMAT ( // * END OF RUN * / 1X )
0695 STOP
0700 END

```

Step Demand Generator--Total Demand

```

0001  PROGRAM STEPS
0010  DIMENSION TDEM(500), NDAY(500), STEP(500), TDEM1(500)
0020  PRINT 30
0030  FORMAT ( /*-NAMES OF INPUT AND OUTPUT FILES * )
0040  INPUT, NFILE1, NFILE2
0050  CALL OPEN(1,NFILE1,-1)
0060  IF ( NFILE1 .NE. NFILE2 ) CALL OPEN(2,NFILE2,-1)
0070  PRINT 80
0080  FORMAT ( *-FILE LENGTH * )
0090  INPUT, LEN
0100  PRINT 110
0110  FORMAT ( *-PLOT OUTPUT * )
0120  INPUT, NPLOT
0130  PRINT 140
0140  FORMAT ( *-INSTRUCTIONS FOR INPUTING STEPS * )
0150  INPUT, INST
0160  IF ( INST .EQ. 3HYES ) CALL INSTR
0170  NS = 0
0180  INPUT, N1, N2
0190  IF ( N1 .EQ. 3HEND .AND. N2 .EQ. 2HOF ) GO TO 240
0200  NS = NS + 1
0210  NDAY(NS) = N1
0220  STEP(NS) = N2
0230  GO TO 180
0240  NDAY(NS+1) = 0
0250  READ(1) ( TDEM(I),I=1,LEN)
0260  KK = 1
0270  ADD = 0.0
0280  YMIN = 1000000.0
0290  YMAX = -1000000.0
0300  DO 390 LP = 1,LEN
0310  IF ( LP .NE. NDAY(KK) ) GO TO 340
0320  ADD = STEP(KK)
0330  KK = KK + 1
0340  TDEM1(LP) = TDEM(LP) + ADD
0350  IF ( TDEM(LP) .LT. YMIN ) YMIN = TDEM(LP)
0360  IF ( TDEM(LP) .GT. YMAX ) YMAX = TDEM(LP)
0370  IF ( TDEM1(LP) .LT. YMIN ) YMIN = TDEM1(LP)
0380  IF ( TDEM1(LP) .GT. YMAX ) YMAX = TDEM1(LP)
0390  CONTINUE
0392  YDIF = YMAX - YMIN
0394  XDIF = LEN - 1
0400  IF ( NFILE1 .EQ. NFILE2 ) GO TO 450
0410  WRITE(2) ( TDEM1(I),I=1,LEN )
0430  CALL CLOSE(2,NFILE2)
0440  GO TO 472
0450  REWIND 1
0460  WRITE(1) (TDEM1(I),I=1,LEN)
0470  CALL CLOSE(1,NFILE1)
0472  PRINT 474
0474  FORMAT ( * INPUT N1, N2, AND N3 * /

```

```

0475A * RESULTS(I), I =N1,N2,N3 ..... WILL BE PRINTED * )
0476 INPUT, N1, N2, N3
0478 IF ( N1 .EQ. 0 .OR. N2 .LT. N1 ) GO TO 492
0480 PRINT 482
0482 FORMAT ( // * DAY STEP DEMAND NEWDEM * / 1X )
0484 DO 490 LP = N1, N2, N3
0486 PRINT 488, LP, TDEM1(LP)-TDEM(LP), TDEM(LP), TDEM1(LP)
0488 FORMAT ( 1X, I3, 1X, F5.1, 2(1X,F6.1) )
0490 CONTINUE
0492 IF ( NPLOT .NE. 3HYES ) GO TO 570
0494 DO 540 LP = 1, LEN
0500 TDEM(LP) = ( TDEM(LP) - YMIN ) / YDIF
0510 TDEM1(LP) = ( TDEM1(LP) - YMIN ) / YDIF
0520 XP = LP
0530 STEP(LP) = ( XP - 1.0 ) / XDIF
0540 CONTINUE
0550 CALL PLOTTER(STEP,TDEM ,LEN,1,1H1,0.0,1.0,0.0,1.0,6HPCTDAY,6HPCT
)
0560 CALL PLOTTER(STEP,TDEM1,LEN,3,1H2,0.0,1.0,0.0,1.0,6HPCTDAY,6HPCT
)
0570 PRINT 580
0580 FORMAT ( // * END OF RUN * )
0590 STOP
0600 END
0610 SUBROUTINE INSTR
0620 PRINT 630
0630 FORMAT( /* ON EACH LINE, INPUT 1 VALUE OF DAY NO. AND STEP SIZE
0631A * AFTER THE LAST LINE INPUT "END OF FIL". * /
0632A * THE STEP SIZE ON A GIVEN LINE WILL BE ADDED TO THE DEMAND *
0633A * CURVE STARTING AT THE DAY SPECIFIED AND CONTINUING UP TO, */
0634A * BUT NOT INCLUDING, THE DAY SPECIFIED ON THE NEXT LINE. * /
0635A * THE STEP SPECIFIED ON THE LAST LINE IS ASSUMED TO BE EFFECT
/
0636A * UP TO THE END OF THE DEMAND CURVE. * / 1X )
0640 RETURN
0650 END

```

Matrix Inversion Subroutine

```

1 SUBROUTINE MATINV(A,NSUB,B,MSUB,DET,NMAX)
2 DIMENSION A(NMAX,NSUB),B(NMAX,MSUB)
7 DIMENSION IPIVOT(50),INDEX(50,2),PIVOT(50)
9 EQUIVALENCE (IROW,JROW),(ICOLUMN,JCOLUMN),(AMAX,T,SWAP)
10 DETERM=1.0
11 N=NSUB
12 M=MSUB
15 DO 20 J=1,N
20 IPIVOT(J)=0
30 DO 550 I=1,N
40 AMAX=0.0
45 DO 105 J=1,N
50 IF(IPIVOT(J)-1)60,105,60
60 DO 100 K=1,N
70 IF(IPIVOT(K)-1)80,100,740
80 IF(ABSF(AMAX)-ABSF(A(J,K)))85,100,100
85 IROW=J
90 ICOLUMN=K
95 AMAX=A(J,K)
100 CONTINUE
105 CONTINUE
110 IPIVOT(ICOLUMN)=IPIVOT(ICOLUMN)+1
130 IF(IROW-ICOLUMN)140,260,140
140 DETERM=-DETERM
150 DO 200 L=1,N
160 SWAP=A(IROW,L)
170 A(IROW,L)=A(ICOLUMN,L)
200 A(ICOLUMN,L)=SWAP
205 IF(M)260,260,210
210 DO 250 L=1,M
220 SWAP=B(IROW,L)
230 B(IROW,L)=B(ICOLUMN,L)
250 B(ICOLUMN,L)=SWAP
260 INDEX(I,1)=IROW
270 INDEX(I,2)=ICOLUMN
310 PIVOT(I)=A(ICOLUMN,ICOLUMN)
320 DETERM=DETERM*PIVOT(I)
330 A(ICOLUMN,ICOLUMN)=1.0
340 DO 350 L=1,N
350 A(ICOLUMN,L)=A(ICOLUMN,L)/PIVOT(I)
355 IF(M)380,380,360
360 DO 370 L=1,M
370 B(ICOLUMN,L)=B(ICOLUMN,L)/PIVOT(I)
380 DO 550 L1=1,N
390 IF(L1-ICOLUMN)400,550,400
400 T=A(L1,ICOLUMN)
420 A(L1,ICOLUMN)=0.0
430 DO 450 L=1,N
450 A(L1,L)=A(L1,L)-A(ICOLUMN,L)*T
455 IF(M)550,550,460
460 DO 500 L=1,M

```

```
500 B(L1,L)=B(L1,L)-B(ICOLUMN,L)*T
550 CONTINUE
600 DO 710 I=1,N
610 L=N+1-I
620 IF(INDEX(L,1)-INDEX(L,2))630,710,630
630 JROW=INDEX(L,1)
640 JCOLUMN=INDEX(L,2)
650 DO 705 K=1,N
660 SWAP=A(K,JROW)
670 A(K,JROW)=A(K,JCOLUMN)
700 A(K,JCOLUMN)=SWAP
705 CONTINUE
710 CONTINUE
720 DET=DETERM
740 RETURN
750 END
760 ENDPROG
```

Plot Subroutine

```

0001 SUBROUTINE PLOTTER(X,Y,NUM,NOPT,NSY=,XMIN,XMAX,YMIN,YMAX,LABX,L
0010 DIMENSION X(1), Y(1), NP(51,26)
0011 DIMENSION XLAB(6)
0015 IF ( NOPT .EQ. 0 ) RETURN
0020 GO TO ( 30, 80, 80, 30 ), NOPT
0030 CONTINUE
0034 DO 64 LP1 = 1,26
0036 IF ( LP1 .EQ. 1 .OR. LP1 .EQ. 26 ) 38, 52
0038 DO 42 LP2 = 1,51
0040 NP(LP2,LP1) = 1H-
0042 CONTINUE
0044 DO 48 LP2 = 1,51,10
0046 NP(LP2,LP1) = 1H+
0048 CONTINUE
0050 GO TO 64
0052 DO 56 LP2 = 2,51
0054 NP(LP2,LP1) = 1H
0056 CONTINUE
0058 NP(1,LP1) = 1HI
0060 LPM1 = LP1 - 1
0062 IF ( LPM1 - (( LPM1/5 ) * 5 ) .EQ. 0 ) NP(1,LP1) = 1H+
0064 CONTINUE
0066 RANGEX = XMAX - XMIN
0068 RANGEY = YMAX - YMIN
0080 DO 140 LP = 1,NUM
0090 IX = ((( X(LP)-XMIN ) / RANGEX ) * 50.0 ) + 1.5
0100 IY = ((( Y(LP)-YMIN ) / RANGEY ) * 25.0 ) + 1.5
0110 IF ( IX .LT. 1 .OR. IX .GT. 51 ) GO TO 140
0120 IF( IY .LT. 1 .OR. IY .GT. 26 ) GO TO 140
0130 NP(IX,IY) = NSYM
0140 CONTINUE
0142 IF ( NOPT .LT. 3 ) GO TO 270
0144 PRINT 146
0146 FORMAT ( // 1X )
0151 NY = 26
0152 DO 186 LP1 = 1,26
0153 LOC = 1
0154 LABYY = 6H
0155 IF ( NY .EQ. 13 ) LABYY = LABY
0156 DO 162 LP2 = 1,51
0158 IF ( NP(LP2,NY) .EQ. 1H ) GO TO 162
0160 LOC = LP2
0162 CONTINUE
0166 NY1 = NY - 1
0168 IF ( NY1 - (( NY1/5)*5) .EQ. 0 ) 170, 180
0170 YH = NY1
0172 YLAB = (( YH / 25.0 ) * RANGEY ) + YMIN
0174 PRINT 176, YLAB, ( NP(I,NY), I = 1,LOC )
0176 FORMAT ( 1X, E12.5, 1X, 51A1 )
0178 GO TO 184
0180 PRINT 182, LABYY, ( NP(I,NY), I = 1,LOC )

```

```
0182  FORMAT ( 7X, A6, 1X, 51A1 )
0184  NY = NY - 1
0186  CONTINUE
0190  RXDIV = RANGEX / 5.0
0200  XLAB(1) = XMIN
0210  DO 230 LP = 2,5
0220  XLAB(LP) = XLAB(LP-1) + RXDIV
0230  CONTINUE
0240  XLAB(6) = XMAX
0250  PRINT 260, (XLAB(I),I=1,5,2),(XLAB(J),J=2,6,2),LABX
0260  FORMAT(8X,E11.5,2(9X,E11.5)/9X,3(9X,E11.5) / 32X,A6// 1X)
0270  CONTINUE
0280  RETURN
0290  END
```

Recipe Demand Generator--Uniform Distribution

```
0001 PROGRAM RDMND
0010 COMMON RBANK(42,12),TDEM(312),RDEM(312,12)
0012 PRINT 13
0013 FORMAT(*INPUT NAME IN AND NAME OUT*)
0014 INPUT, NAMEF, NAMES
0020 CALL OPEN (3,4HBANK,-1)
0022 READ(3)RBANK
0023 REWIND 3
0024 CALL CLOSE (3,4HBANK)
0030 CALL OPEN (1,NAMEF,-1)
0031 READ(1)TDEM
0032 REWIND 1
0033 CALL CLOSE (1,NAMEF)
0035 K=0
0040 DO 122 I=1,312
0045 K=K+1
0046 IF(K.GT.42)K=1
0050 DO 120 J=1,12
0070 T=RBANK(K,J)
0071 T=T/100.0
0080 CALL UNIFORM(T,X)
0090 RDEM(I,J)=TDEM(I)*X
0120 CONTINUE
0122 CONTINUE
0124 CALL OPEN(2,NAMES,-1)
0125 WRITE(2)RDEM
0126 REWIND 2
0127 CALL CLOSE(2,NAMES)
0130 END
```

Recipe Demand Generator--Normal Distribution

```
0001 PROGRAM RDMND
0010 COMMON RBANK(42,12),TDEM(312),RDEM(312,12)
0012 PRINT 13
0013 FORMAT(*INPUT NAME IN AND NAME OUT*)
0014 INPUT, NAMEF, NAMES
0020 CALL OPEN (3,4HBANK,-1)
0022 READ(3)RBANK
0023 REWIND 3
0024 CALL CLOSE (3,4HBANK)
0030 CALL OPEN (1,NAMEF,-1)
0031 READ(1)TDEM
0032 REWIND 1
0033 CALL CLOSE (1,NAMEF)
0035 K=0
0040 DO 122 I=1,312
0045 K=K+1
0046 IF(K.GT.42)K=1
0050 DO 120 J=1,12
0070 T=RBANK(K,J)
0071 T=T/100.0
0080 CALL NORMAL(T,X)
0090 RDEM(I,J)=TDEM(I)*X
0120 CONTINUE
0122 CONTINUE
0124 CALL OPEN(2,NAMES,-1)
0125 WRITE(2)RDEM
0126 REWIND 2
0127 CALL CLOSE(2,NAMES)
0130 END
```

Uniform Random Number Generator

```
0001 SUBROUTINE UNIFORM(T,X)
0010 A=T-.10
0020 B=T+.10
0030 R=RANF(-1)
0040 X=A+(B-A)*R
0050 RETURN
0060 END
0070 ENDPROG
```

Normal Random Number Generator

```
0001 SUBROUTINE NORMAL(T,X)
0010 SD=.05
0020 X=(-2.0*LOGF(RANF(-1)))**.5*COSF(6.283*RANF(-1))*
0030 ASD+T
0040 RETURN
0050 END
0060 ENDPROG
```

Forecast Program (Test)

```

0001 PROGRAM FORSIM
0010 COMMON AVG(6),TDEM(312),TND(6),TFORE(319),RDEM(312,12),
0011ARR(6,12,7),RRT(6,12,7),RFORE(319,12)
0013 CALL OPEN(1,5HFILE1,-1)
0015 READ, NRUN,NAMEF,NAMER,ALPHA,BETA,ITNO,ITNOP,IRNO,IRNOP
0017 IF ( NRUN .EQ. 2 ) GO TO 33
0020 DO 30 L1 = 1,6
0021 AVG(L1) = TND(L1) = 0.0
0022 DO 30 L2 = 1,7
0023 DO 30 L3 = 1,12
0024 RR(L1,L3,L2) = RRT(L1,L3,L2) = 0.0
0030 CONTINUE
0031 GO TO 60
0033 REWIND 1
0040 READ(1) AVG, TND, RR, RRT
0045 REWIND 1
0060 CALL OPEN(2,NAMEF,-1)
0062 READ(2) TDEM
0064 REWIND 2
0065 CALL CLOSE(2,NAMEF)
0066 CALL OPEN(3,NAMER,-1)
0068 READ(3) RDEM
0070 REWIND 3
0072 CALL CLOSE(3,NAMER)
0076 K1=0
0080 K2=0
0130 DO 267 I=1,312
0140 K1=K1+1
0160*****CALCULATE NEW AVERAGE FOR DAY OF THE WEEK
0170 FAVG=ALPHA*(TDEM(I)-AVG(K1))+AVG(K1)
0180*****CALCULATE CURRENT TREND FOR DAY OF THE WEEK
0190 CTND=FAVG-AVG(K1)
0200*****CALCULATE NEW TREND
0210 FTND=ALPHA*(CTND-TND(K1))+TND(K1)
0220*****CALCULATE TOTAL FORECAST FOR DAY (I+6)
0230 TFORE(I+6)=FAVG+((1.0-ALPHA)/ALPHA)*FTND
0240*****UPDATE AVERAGE AND TREND
0250 AVG(K1)=FAVG
0260 TND(K1)=FTND
0261 IF ( I .LT. ITNO .OR. I .GT. ITNOP ) GO TO 265
0262 PRINT 263, K1,AVG(K1),TND(K1),TFORE(I+6),TDEM(I+6),I,(I+6)
0263 FORMAT(1X,I2,4F10.4,2I4)
0265 IF(K1.EQ.6)K1=0
0267 CONTINUE
0269 K1=0
0270 DO 500 I=1,312
0272 KI=K1+1
0273 K2=K2+1
0275 DO 410 J = 1,12
0280*****CALCULATE CURRENT RECIPE RATIOS
0290 CRR=RDEM(I,J)/TDEM(I)

```

```

0300*****CALCULATE NEW RECIPE RATIO
0310 FRR=BETA*(CRR-RR(K1,J,K2))+RR(K1,J,K2)
0320*****CALCULATE CURRENT RECIPE RATIO TREND
0330 CRRT=FRR-RR(K1,J,K2)
0340*****CALCULATE NEW RECIPE RATIO TREND
0350 FRRT=BETA*(CRRT-RRT(K1,J,K2))+RRT(K1,J,K2)
0351 N1=(I+6)-(((I+6)/6)*6)
0352 IF(N1.EQ.0)N1=6
0353 N2=(I+6)-(((I+6)/7)*7)
0354 IF(N2.EQ.0)N2=7
0360*****CALCULATE RECIPE FORECAST FOR DAY I+6
0370 RFORE(I+6,J)=TFORE(I+6)*(RR(N1,J,N2)+((1.0-BETA)/BETA)*
0371ARRT(N1,J,N2))
0380*****UPDATE RECIPE RATIO AND RECIPE RATIO TREND
0390 RR(K1,J,K2)=FRR
0400 RRT(K1,J,K2)=FRRT
0402 IF (I.LT.IRNO.OR.I.GT.IRNOP)GO TO 410
0403 PRINT 405,RR(N1,J,N2),RRT(N1,J,N2),RFORE(I+6,J),TFORE(I+6),
0404A RDEM(I+6,J),K1,J,K2,I,N1,N2
0405 FORMAT(1X,5F9.4,6I4)
0410 CONTINUE
0420*****CHECK DAY AND MENU AND RESET COUNTERS
0430 IF(K1-6)450,440,440
0440 K1=0
0450 IF(K2-7)500,460,460
0460 K2=0
0500 CONTINUE
0525 WRITE(1) AVG, TND, RR, RRT
0527 REWIND 1
0530 CALL CLOSE(1,5HFILE1)
0535 CALL OPEN(4,5HTFORE,-1)
0540 WRITE(4) TFORE
0550 REWIND 4
0560 CALL CLOSE(4,5HTFORE)
0570 CALL OPEN(5,5HRTFORE,-1)
0575 WRITE(5) RFORE
0580 REWIND 5
0590 CALL CLOSE(5,5HRTFORE)
0750 END
0760 ENDPROG
0770 1 TDEM1 RDEM1
0780 .37 .41 313 313 309 310

```

Statistical Program

```

0010 PROGRAM COMPRE
0020 COMMON TFORE(319),TDEM(312),RFORE(319,12),RDEM(312,12)
0025 COMMON ERR(312),RERR(312,12)
0030 PRINT 40
0040 FORMAT(*FILE NAME 1,FILE NAME 2,START NO.,STOP NO.,NRUN*)
0050 INPUT, NAME1,NAME2,LOC,LEN,NRUN
0060 CALL OPEN(1,NAME1,-1)
0070 CALL GETPTR(1,L1,L2)
0080 CALL OPEN(2,NAME2,-1)
0090 CALL GETPTR(2,M1,M2)
0100 PRINT 110,L2,M2
0110 FORMAT(*LENGTH OF FILE 1 IS*I8,2X,*LENGTH OF FILE 2 IS*,I8)
0115 R=LEN-LOC+1
0120 IF(NAME1.EQ.5HTFORE)GO TO 140
0130 IF(NAME1.EQ.5HRFORE)GO TO 180
0140 READ(1)TFORE;READ(2)TDEM
0150 IF(NRUN.EQ.2)GO TO 260
0160 DO 170 I=LOC,LEN
0165 PRINT 200,TFORE(I),TDEM(I)
0170 CONTINUE
0175 GO TO 720
0180 READ(1)RFORE;READ(2)RDEM
0183 IF(NRUN.EQ.2)GO TO 370
0185 DO 195 I=LOC,LEN
0187 DO 195 J=1,12
0190 PRINT 200QRFORE(I,J),RDEM(I,J)
0195 CONTINUE
0200 FORMAT(1X,2F10.2)
0250 IF(NRUN.EQ.1)GO TO 720
0260 STDEN=TERR=TERR2=0.0
0270 DO 310 I=LOC,LEN
0280 ERR(I)=TFORE(I)-TDEM(I)
0283 TAERR=TAERR+ABS(ERR(I))
0287 TERR2=TERR2+(ERR(I)**2)
0290 STDEN=STDEN+TDEM(I)
0300 TERR=TERR+ERR(I)
0310 CONTINUE
0320 SDEV=SQRT((TERR2/R)-((TERR/R)**2))
0330 CFVAR=SDEV/(STDEN/R)
0340 PRINT 350,SDEV,CFVAR,TERR2,TAERR,STDEN
0350 FORMAT(*THE STATS FOR TFORE ARE*/(10X,F15.4))
0355 FORMAT(*THE STATS FOR RFORE ARE*/(10X,F15.4))
0360 GO TO 720
0370 SRDEM=TRERR=TRERR2=0.0
0375 S=(LEN-LOC+1)*12
0380 DO 450 I=LOC,LEN
0390 DO 450 J=1,12
0420 RERR(I,J)=RFORE(I,J)-RDEM(I,J)
0423 TARERR=TARERR+ABS(RERR(I,J))
0427 TRERR2=TRERR2+(RERR(I,J)**2)
0430 SRDEM=SRDEM+RDEM(I,J)

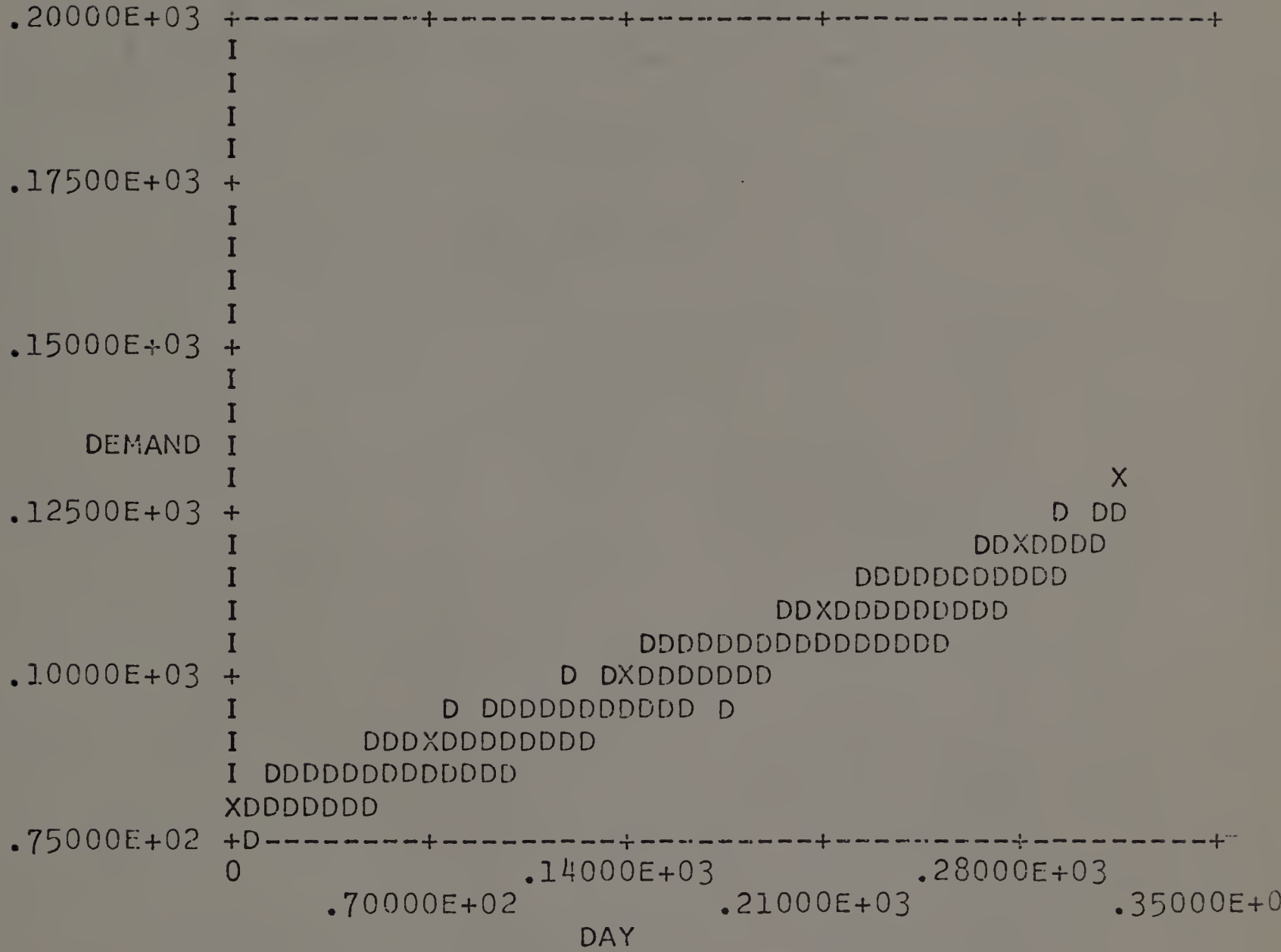
```

```
0440 TRERR=TRERR+RERR(I,J)
0450 CONTINUE
0460 RSDEV=SQRT((TRERR2/S)-((TRERR/S)**2))
0470 CFVAR=RSDEV/(SRDEM/S)
0480 PRINT 355,RSDEV,CFVAR,TRERR2,TARERR,SRDEM
0490 DO 710 J=1,12
0495 SRDEM=TRERR=TRERR2=TARERR=T=0.0
0500 DO 560 I=LOC,LEN
0505 T=T+1.0
0510 RERR(I,J)=RFORE(I,J)-RDEM(I,J)
0520 TARERR=TARERR+ABS(RERR(I,J))
0530 TRERR2=TRERR2+(RERR(I,J)**2)
0540 SRDEM=SRDEM+RDEM(I,J)
0550 TRERR=TRERR+RERR(I,J)
0560 CONTINUE
0570 RSDEV=SQRT((TRERR2/T)-((TRERR/T)**2))
0580 CFVAR=RSDEV/(SRDEM/T)
0590 PRINT 600,J,RSDEV,CFVAR,TRERR2,TARERR,SRDEM
0600 FORMAT(*THE STATS FOR RECIPE*1X,I4,2X,*ARE*/(10X,F15.4))
0710 CONTINUE
0720 REWIND 1 $ REWIND 2
0730 CALL CLOSE(1,NAME1) $ CALL CLOSE(2,NAME2)
0740 END
0750 ENDPROG
```

APPENDIX J

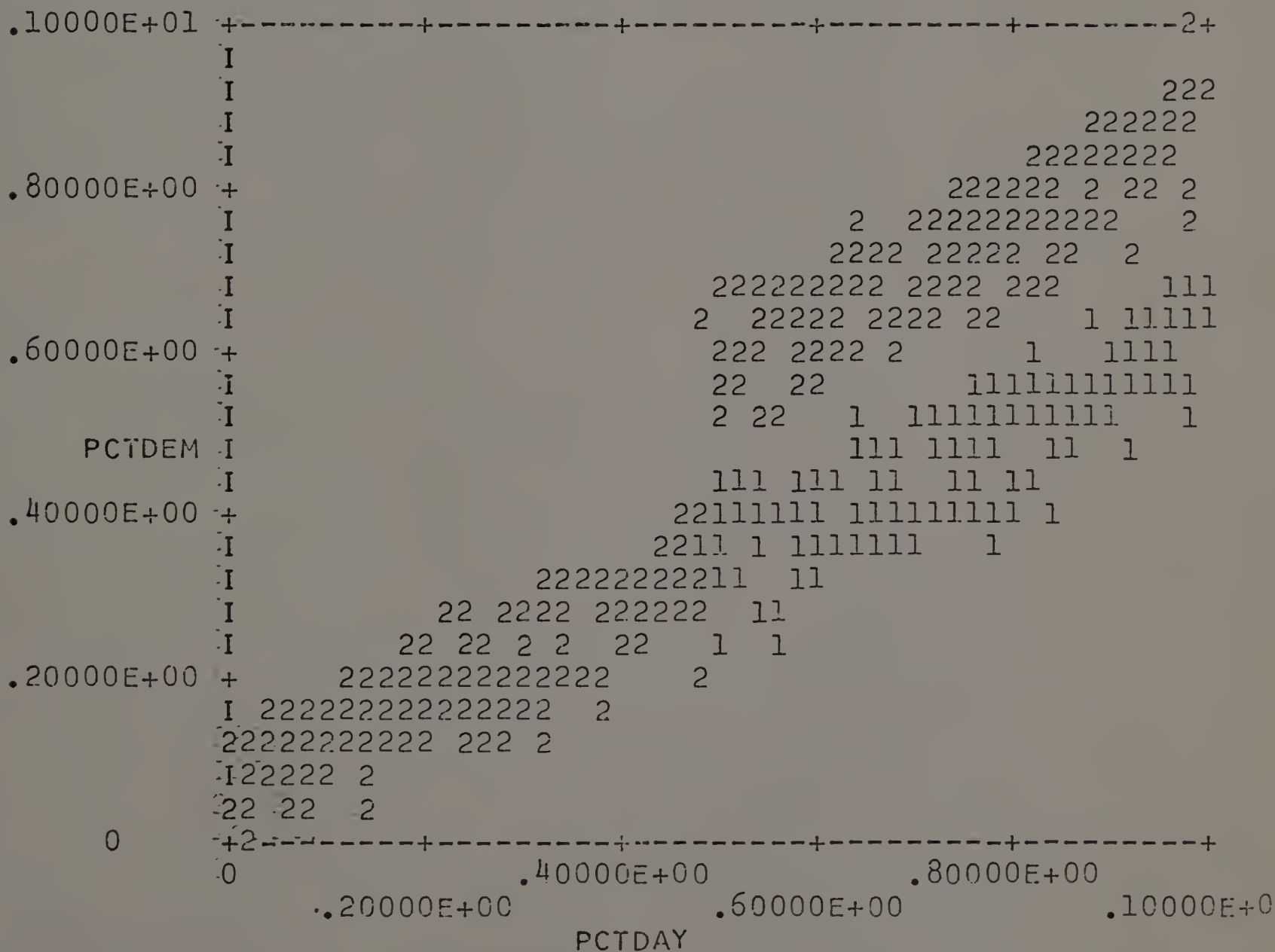
DEMAND PLOTS--FORECAST ALGORITHM TEST

Ramp Demand Data--First Year

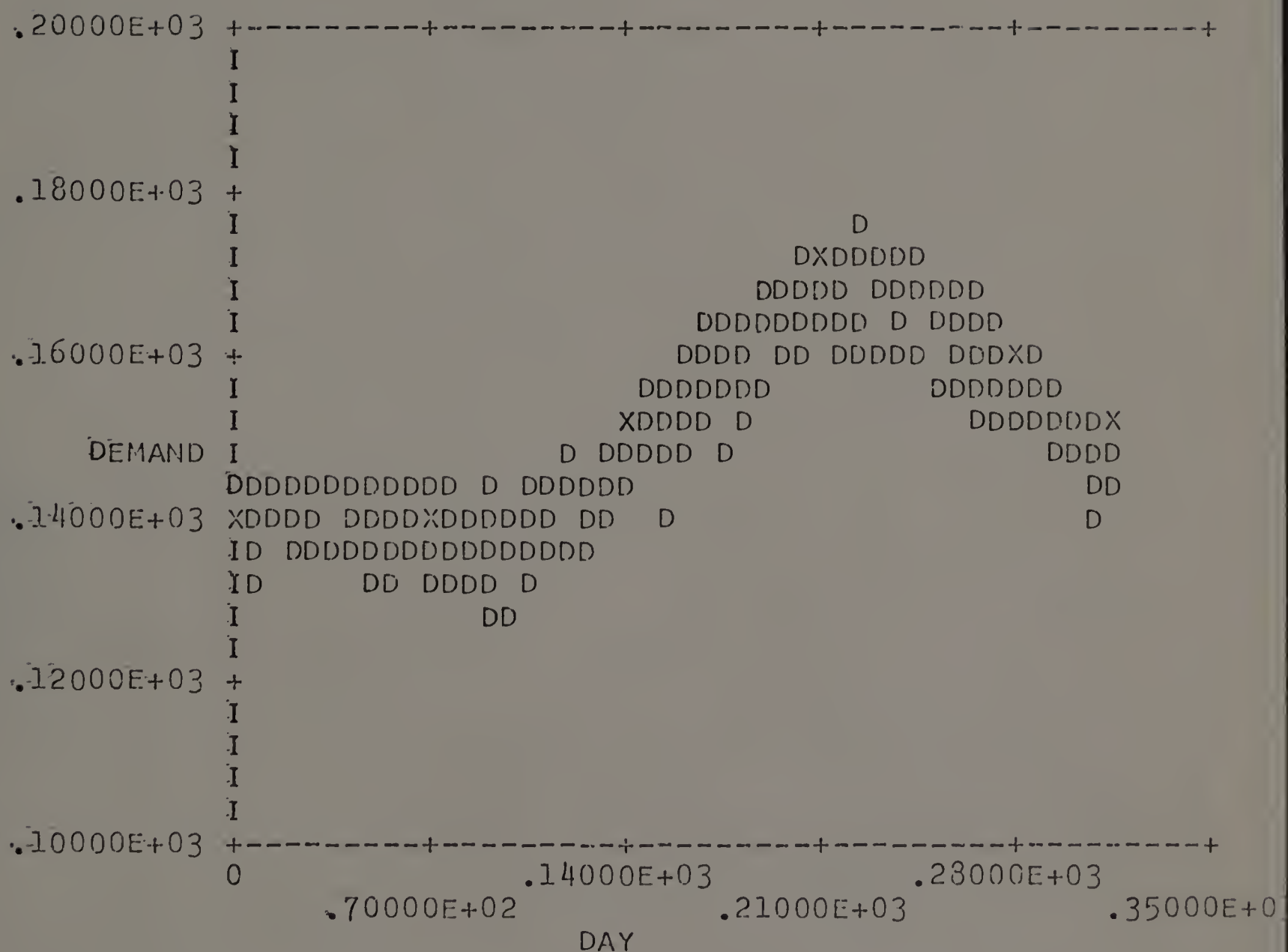


Step Demand Data--Based on Second-Year Ramp

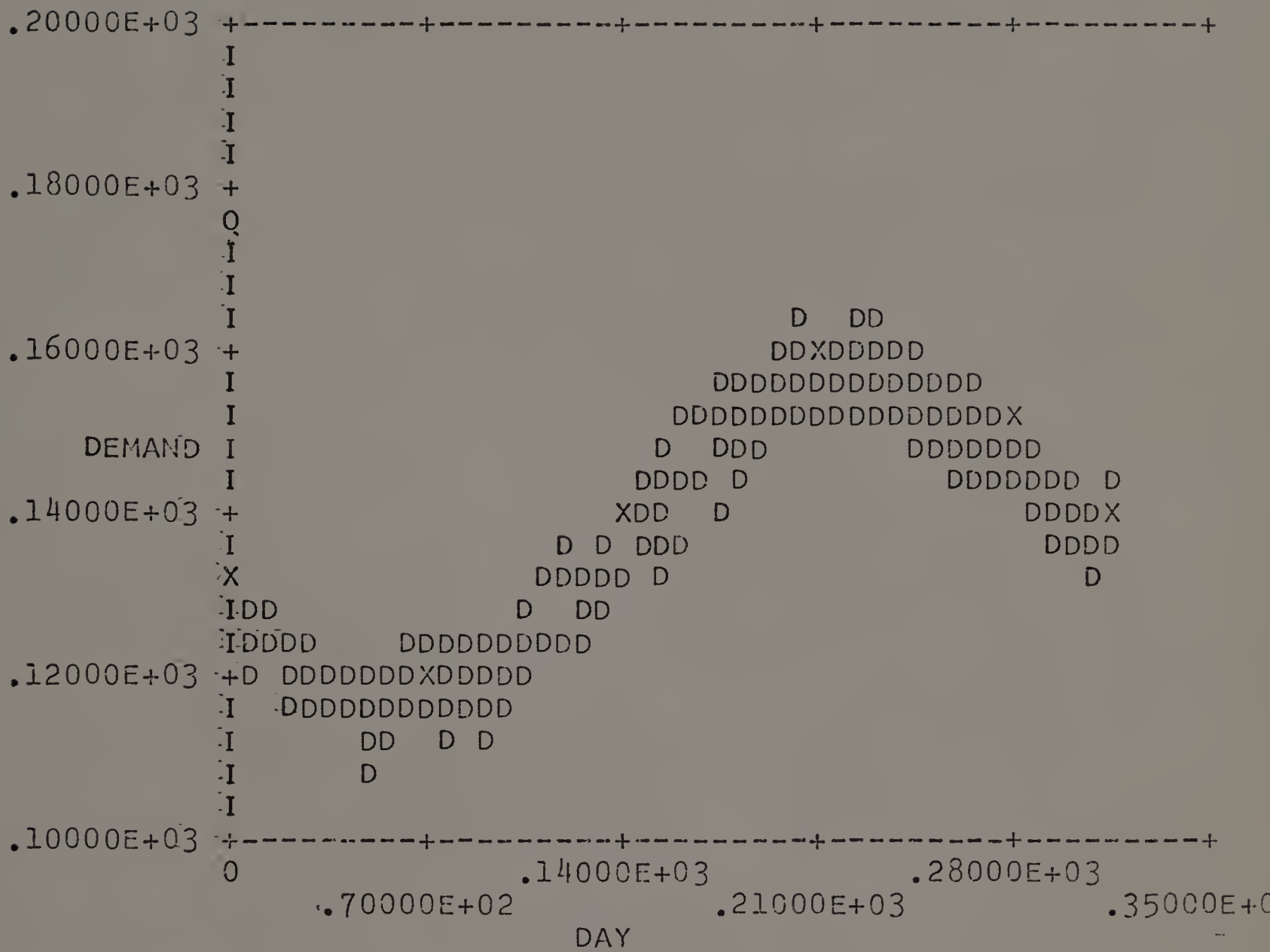
DAY	STEP	DEMAND	NEWDEM
150	0	149.0	149.0
151	0	149.0	149.0
152	0	154.0	154.0
153	0	144.0	144.0
154	0	139.0	139.0
155	0	145.0	145.0
156	20.0	152.0	172.0
157	20.0	149.0	169.0
158	20.0	151.0	171.0
159	20.0	156.0	176.0
160	20.0	142.0	162.0
161	20.0	148.0	168.0
162	20.0	155.0	175.0



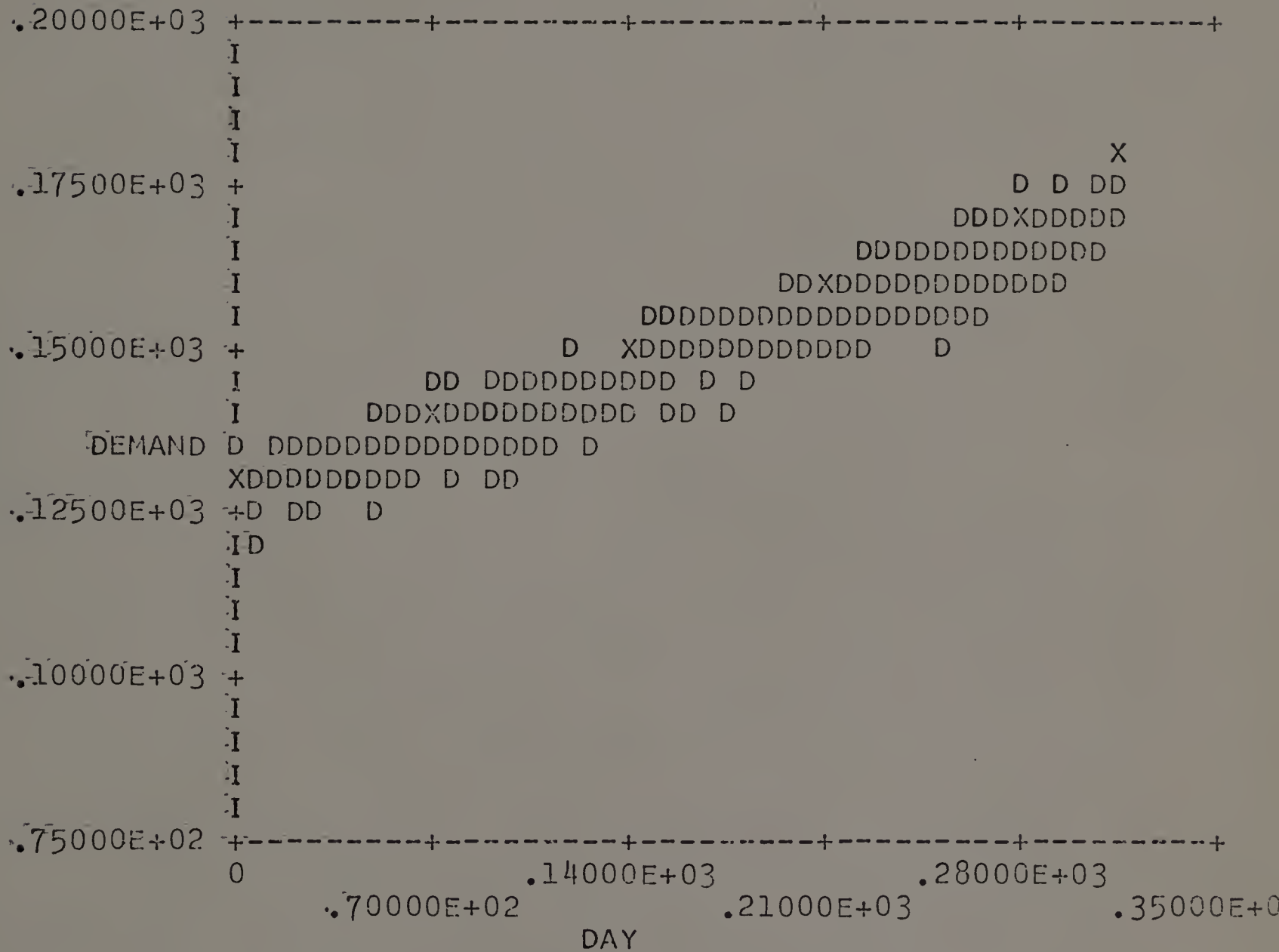
Cycle Demand Data--Second Year



Cycle Demand Data--First Year



Ramp Demand Data--Second Year



APPENDIX K

SELECTED RESULTS--FORECAST TEST PROGRAM

1. - Total Forecast; Ramp; Alpha = .07, Year 1.
Total Demand = 45,644; Mean Demand = 149.16

Alpha	S.D.	Co. Var.	Tot. Err. ²	Tot. Abs. Demand
.05	3.8172	.0256	4459	961
.07	3.2797	.0220	3292	821
.08	3.2801	.0220	3292	817
.09	3.3279	.0223	3389	825
.10	3.3764	.0226	3488	835
.20	3.5358	.0237	3823	864

2. - Total Forecast; Cycle. Alpha = .37 Year 1,2.
Total Demand = 45,955; Mean Demand = 150.18

.36	4.1140	.0274	5179	1018
.37	4.1130	.0274	5176	1016
.38	4.1133	.0274	5177	1017

3. - Total Forecast; Step; Alpha = .07, Year 1
Total Demand = 48,784; Mean Demand = 159.42

.2	5.3752	.0337	8841	1123
.40	5.0751	.0318	7882	1088
.41	5.0739	.0318	7877	1088
.42	5.0735	.0318	7877	1089

4. - Total Recipe Forecast; Ramp; Alpha = .07 Year 1
Total Demand = 228,677; Mean Demand = 62.28

Beta	S.D.	Co. Var.	Tot. Err. ²	Tot. Abs. Demand
.09	9.7136	.1560	346470	28011
.10	9.5065	.1527	331852	27880
.11	9.7239	.1561	347204	28753
.20	11.2472	.1806	464509	34405

5. - Total Recipe Forecast; Cycle; Alpha = .37 Years 1,2.
Total Demand = 228,532; Mean Demand = 62.24

.30	6.4695	.1040	153688	19093
.41	5.8086	.0933	123893	17392
.42	5.8047	.0933	123727	17391
.43	5.8054	.0933	123758	17400

6. - Total Recipe Forecast; Step; Alpha = .07 Year 1,
.41 Year 2.
Total Demand = 244,460; Mean Demand = 66.57

.08	10.8723	.1626	430183	31676
.09	10.2938	.1546	389096	29950
.10	10.3119	.1549	390462	29942
.20	12.8337	.1928	604788	36702

VITA

Albert L. Wrisley, Jr., was born in Northport, Michigan, on August 12, 1928. He received his B.S. degree in Hotel Administration from Cornell University, Ithaca, New York, in 1950 and his M.A. degree in Hotel Administration from Michigan State University, East Lansing, Michigan, in 1963.

Professionally, his career began in the tradition of most "hotel brats"--at the pot sink of the family resort. After graduating from college he spent eleven years operating restaurants and hotels in Chicago, New York City, Northern Michigan, Florida and Ohio. Since 1960 he has held the ranks of assistant and associate professor of Hotel and Restaurant Administration at the University of Massachusetts, where he specializes in managerial accounting and control systems.

