

TIME FACTORS IN PREPARATION OF SELECTED ENTREES

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INTRODUCTION

The time factor as related to cooks' work load in institutional food service often is overlooked in menu planning, resulting in overwork one day and excessive free time the next. With labor cost becoming increasingly higher a balanced work load is essential if efficient use is to be made of personnel. Closely related to the labor factor is the planning of menus with variety in method of preparation for optimum use of equipment. A menu with an overabundance of items requiring baking, for example, could result in a last minute change.

Not only are color, texture, flavor, shape, nutritional requirements, and method of preparation important in planning menus for an institution, but management factors must be considered also. Arrangement of the kitchen and its relation to the serving area, amount and type of equipment, and number and skills of personnel cannot be ignored. The manager should be aware of the approximate time required for completing various processes in food production.

It may be difficult for the food service manager or dietitian to consider all of the many factors involved in planning menus and some may be overlooked. For this reason the computer may prove to be a valuable tool in planning menus and food production. It can accept the information programmed for it and in minutes accomplish what could take hours to do manually. Several institutions have considered cost and nutritional value in planning menus by computer and some have included palatability

factors. Equipment and labor, however, have been considered to a lesser extent. A lack of basic information with assigned numerical values has delayed inclusion of the latter factors in most computer planning programs.

This study was a preliminary investigation of menu preparation time as it related to a residence hall food service operation with a stable number of customers at all meals. The objective was to develop a procedure for estimating time factors in entree preparation that could be programmed for the computer.

REVIEW OF LITERATURE

Menu Planning

The menu, according to Balsley (1964) is the core around which all functions of the food service revolve. Purchasing, storing, preparation, and serving of food cannot be effectively accomplished without a well-planned menu. It must represent three different points of view. The customer desires an amount and variety of food to satisfy him, the workers have the task of preparing attractive, appetizing, food, while management desires satisfied clientele and the realization of a profit (West et al., 1966).

The successful menu planner must have a wide range of food likes, a knowledge of factors that influence food quality, imagination, and a sincere interest in pleasing the customers. West et al. (1966) cited a number of basic factors that must be considered, as color, flavor, texture, shape, consistency,

temperature, and method of preparation. Also to be considered is a knowledge of the people to be served, their food habits, nutritional needs, and the number to be served. The arrangement of the kitchen, available equipment, personnel, their number and abilities, money allotted in the budget, and type of service are important factors also.

The menu is the first step in control of food costs according to West et al. (1966), as food cost is directly dependent on the menu. Labor and equipment costs also are affected by the menu. Equipment should be evaluated to determine if it is needed to improve quality, handle quantity, or reduce cost and time of operation. If special equipment must be purchased, this could result in an expensive menu item, though the initial food cost might have been low (Kotschevar and Terrell, 1966).

Not only must there be balance among all the kitchen stations, as Sandler (1968) noted, but a smooth-running kitchen must have a balanced use of all equipment. Treat and Richards (1966) advocate a menu that includes items requiring some use of all pieces of equipment. Man machine charts, as Kotschevar (1968) explained, aid in determining usage of equipment. One can see graphically the time the equipment is used and idle and when the operator is working. Idle time from the machine is apparent and thus best utilization of employees' time might be made. Use of a cross chart is an aid to efficient placement of equipment, which is essential if optimum utilization is to be made from it.

One controlling factor in menu planning as noted by Treat

and Richards (1966) is the amount and skill of available labor. With the steady rise in food and labor costs the current trend is toward a simplified menu with few choices.

The menu maker may be guilty, though unconsciously, of building excessive labor costs into the menu (Sandler, 1968). The various points necessary in achieving a well-planned menu may be thoroughly carried out, but the weak point may be the failure to evaluate what the staff can efficiently accomplish. Experience and size of the staff should be considered when planning the menu. When the menu is overloaded, workers are constantly on the move and become resentful under pressure. Every motion and step taken means money; therefore, each menu item must be carefully studied. Time required for preparing menu items and the resulting labor costs should be considered. Without thought for the choice of menu it is possible to overwork one employee or unit and give too little to another. This may endanger the morale of the staff, as will frequently serving foods requiring lengthy last-minute preparations. Good management utilizes manpower at slack times in order to produce for peak periods. Certain foods may be prepared during these slack times for use at a later date (West et al., 1966).

Two major problems in food production as defined by Greer (1963) are: "(1) to get preparation of quality food done on time, keeping it in good condition for service; and (2) to get food and supplies to different units on schedule." Advance planning must be done so employees will not have to wait for instructions, and each worker must know the deadline for

completing his work. Warfel (1969) suggested that managers of food operations make use of charts that show the time each employee reports for work, hours and days worked. These charts, when compared with work load and job description, help pinpoint areas where time and effort are wasted. Terrell (1966) pointed out that "each man-hour on a payroll represents a reservoir of human energy to be consumed and channeled into productive uses."

Production time as defined by Kotschevar (1964) is the time a worker spends in producing a food product. Total time is the time from beginning of preparation to its finish including time an employee does not work on it. This information provides management with guidelines on when to start production, when to schedule workers, and how long equipment will be in use. Kotschevar (1965) cited the need to properly schedule employees, and he found it helpful to tie in employee schedules with production needs. The workers would then be on hand at busy times and off when not needed.

Christensen (1969) stressed the importance of management operating systems to properly organize work schedules to the workers' abilities. Both workers and management benefit. Workers prefer a productive, well-organized day, while management with greater employee productivity has lowered costs. A number of techniques have been devised to control the loss of money, material, equipment, and other tangible items. Management suffers the greatest financial loss from lost time, much of which is due to poor planning.

As Rasfeld (1968) noted, people no longer are hired for a

single specific job, but rather a combination of three or four types of work. Part-time employees may be used with work hours adjusted to their home needs and schedules, thus eliminating split shifts. Improving procedures and employee training would be a help in making more effective use of employees.

The demand for food service workers, according to Kotschevar (1969), will increase and could double by 1980. Improvements must be made in the on-the-job-training of new workers or in setting up facilities for training them. The industry must mechanize, and more must be done with machines than has been done in the past. Labor that presently is considered below standard will be utilized, while labor productivity will need to be increased.

Computer Applications to Food Service

The computer may be a potential aid to the person responsible for menu planning. At Michigan State University, as in many other schools, the computer is considered so important that students in the Hotel and Restaurant Management curriculum are required to take courses in data processing (Anon, 1968). Although the use of the computer to reduce labor has resulted in fear of job insecurity by some, according to Kotschevar (1967), the computer does not replace man. The computer is not a "thinking" machine; it will only give back what is put into it. Programmers use the expression, "garbage in, garbage out."

Clithero (1964) noted that standard menus do not permit examination of all possible combinations of available food items

with any reasonable degree of accuracy. With the advent of high speed computers all combinations of food items can be examined for nutritive value, price, or any factor programmed for it. From this a menu can be calculated that will meet desired requirements. Inefficiencies, however, if not removed will be frozen in. Cummins (1965) suggested starting with original practices and improving them until a total system is achieved. This open-end approach is flexible since participants understand what they have created. The system has been achieved through many errors and struggles so further changes would involve only minor adjustment. It is essential that recipes be accurate and standardized or a computerized program will not work. Development of good, precise recipes might be one of the greatest expenses in converting to computer menus (Anon, 1966a). Balinfy (1964) found that standard recipes with strict portion control were essential for his program which utilized a computer planned menu with optimum nutritive value at a minimum cost.

In a system devised by Fellers (1965) the computer calculates raw food needs, selects from some 1,680 regular and therapeutic menu combinations the best nutritional balance at the lowest possible cost, and provides step-by-step instruction to the cooks. Calculating required ingredients to the nearest portion rather than to the nearest 100 portions should lessen overproduction (Anon, 1966b).

The random approach, a non-mathematical method, was investigated by Brown (1966). An item was selected and tested to note if it met criteria previously determined when paired

with other selected items. In the random approach the alternatives are not known before a decision is reached. A satisfactory solution is produced when the first item selected meets the criteria.

Eckstein (1967) attempted to develop a computer program that would resemble the judgment processes of a dietitian in planning dinner menus. She also explored the possibility of controlling the repetition intervals for individual items as well as categories of items, through acceptability ratings. Raw food cost, color, texture, shape, calories, variety, and acceptability were factors studied. Eckstein concluded that the random approach appeared to be feasible for planning institutional menus. She pointed out that additional factors, as work load, would need to be programmed before menus planned by computer could be used with minimal revision.

In further work by Eckstein (1969), menus were planned for a college residence hall with primary considerations given to acceptability and nutritional needs within an established price. In comparing the two approaches to computer-planned menus, Eckstein noted that linear programs emphasized the management goals of cost and nutrient content control and ignored for the most part consumer and worker expectations. In the random approach the consumer acceptability is emphasized.

Other institutions have made use of the computer. Tullis et al. (1965) used a computer in a research nutrition clinic for two years to compute and summarize dietary data from various studies. The plan proved satisfactory and freed the dietitian

from time-consuming calculations. Anacker (1966) reported the use of data processing in costing recipes and computing monthly summaries of costs in the food service department. Andrews et al. (1967) utilized the computer to determine daily food costs, but stated that additional work would be necessary before labor and overhead costs could be included.

Sager and Ostenso (1968) developed a computerized method for compiling and summarizing recipe data. Amounts of ingredients needed were listed as well as daily food order of required items. This method provided accurate information far more quickly than when done manually.

Knickrehm (1966) demonstrated the use of the computer in simulation studies to determine dining needs. Data, as customer arrival time, group size, and service time could be used in planning a new and similar food service.

Augustine (1967) observed that the computer may be an aid to scheduling. The goal of her study was to schedule observation periods for a variety of experiences that could be fit into students' available time.

The objective of a study by Manchester and Sager (1970) was to involve all areas of the food service operation; to make possible a cost savings in the food service operation, to perform functions not possible when done manually, and to more effectively utilize the dietitian's time.

Work Measurement

Work Sampling. Various methods have been employed to

measure work. Work sampling technique is one method which Barnes (1964) defined as a fact-finding tool based on the laws of probability; measuring work by observations. According to Irons (1960) the variable and diversified activities of each employee make them adaptable to work sampling. A more accurate picture may be obtained from daily sampling for more than two weeks than from a continuous time study over a shorter period. Work sampling generally provides more information with less time and less cost than other methods of work measurement. In six Veteran Administration Hospitals work sampling was used to study food preparation and service activities to provide management with a useful tool for analyzing their operation. A comparison could be made on man-hours used rather than number of employees (Schell, 1962). Work sampling by Schell and Korstad (1964) at two hospitals was done by "using instantaneous observations over a period of time." They found it was possible to measure the work of food service personnel in hospitals, which should provide the dietitian with necessary information for efficient scheduling, forecasting manpower and work-load requirements. Brown (1964), in a residence hall food service study, randomly sampled cooks' activities. Her objectives were to study the positions in the main cooking area and to determine the division of labor time and to note the effectiveness of work sampling as a technique for use in a residence hall food service.

In another application of work sampling, Mastin and Ferrell (1968) pointed out that all activities for which personnel expense is incurred must be evaluated objectively. They prepared

a master schedule from the regular 40-hour week schedule, with the hours to be studied blocked off. The total number of employees working at all times was indicated on the master schedule. Observations were recorded every 6 minutes from 5:00 A.M. to 11:00 P.M. for a 2-week period. A summary included: (1) total time for each activity in minutes, (2) total time in minutes spent by each employee in each of the activities, and (3) total time in minutes in each area at each hour of the day. This summary helped to pinpoint activities that needed further study, indicated when additional supervision would be necessary, and when rescheduling was needed.

Work Measurement. Effective personnel utilization as pointed out by Williams (1969) is essential to cost control. Work measurement provides a technique to analyze the total work load. Work measurement is broader in scope than time and motion and work simplification techniques. By noting frequency, volume, and time of occurrence of tasks making up the work load, the individual work assignments may be developed so no one employee is overloaded or underworked. Work schedules may then be prepared to insure workers at the time and place needed.

Continuous Time Study. Another method of work measurement is that of continuous time study. One hundred dietary department employees were studied over a 9-month period by Coffey et al. (1964) to show how scheduled time was spent. They concluded this technique could be used in evaluating the labor budget to establish standard percentages of labor time for essential activities.

Stumpf (1958) recommended a method for analyzing labor costs using complete time studies of menu items and the job assignments. Her theory was that if the man-hours needed to prepare a given menu item were known, it would be possible to balance the menu and work load for the workers as well as having a nutritionally well-balanced menu. To make a time study, the menu item and worker were identified and a beginning and ending point established. The performance of the average employee was timed. Such studies may indicate the need for better utilization of available labor. This is further indicated in a study by Gleiser (1951) in which arrival and departure time of each employee was noted, the time work was begun and stopped. A complete circuit of all working areas was made every 15 minutes, the same route being followed. During the tour each employee was observed and a notation made of his activity. It was found that 8.2 per cent of hours scheduled netted no return to the institution. It is becoming increasingly important to standardize and identify direct labor costs with food costs. In another study, Stumpf and Donaldson (1957) reported use of the continuous timing technique for recording data on the process chart. The labor time was divided into: get ready, preparation, clean-up, and delivery. A schedule can be prepared by utilizing equipment layout, time studies, and work simplification techniques that will indicate the standard length of time required for production of each menu item.

Labor time for workers engaged in the production of casseroles was recorded by Viszneki (1962). Sequence of the operation

was noted as the workers changed from one task to another. Total labor time was computed, as well as the labor time per portion. Variation in methods of preparation, relative efficiency of workers, and stages of preparation of as-purchased ingredients could account for some of the differences in labor time. When the portion size was adjusted to a common standard there appeared to be a somewhat greater consistency in labor time per portion. The workers are inclined to adjust the pace of their work unless production schedules are scientifically planned.

Thedford (1965) was concerned with direct labor time and cost and ingredient cost of six meat entrees frequently served to patients and personnel. She measured the time needed to produce the entrees. Work was done by regularly scheduled employees with no attempt made to alter the realistic performance. The items observed were: breaded liver, meatcakes, meat loaf, roast beef, creamed dried beef, and beef stew. Time was recorded to the nearest minute by a kitchen wall clock. Timing stopped when an employee engaged in an activity not related to that being studied. Timing was continued if the employee had to wait because of necessary delay. When the process was performed by more than one person, separate observations were made. Consideration was not given to the equipment, utensils, or physical layout. A need was indicated for more observations to substantiate results and to determine whether any direct relationships exist between the time, number of ingredients, number and kind of processes, and the volume of

production.

Master Standard Data. In this technique used by Montag et al. (1964) the motions required to perform an operation were recorded and a symbol and time assigned to each motion. To validate the data obtained in these studies, time studies were done for comparison. The technique was found to be far too time-consuming for economic applications, although it gave reliable answers in analysis of labor time. Based on this study, the use of Master Standard Data may be effective for developing estimates of labor times for certain food production tasks when built into coded standard data elements and the coded times applied to the preparation of a given product. It would be necessary to use MSD in conjunction with time study until standard data for the process times have been developed.

Stop-Watch Time Study. This is the most common method of measuring work according to Barnes (1964). The operation is divided into small elements each timed with a stop-watch, and a time found for each of these elements. Individual times are added together to give the total time needed to perform the process. Allowances are added for personal time, fatigue, and delay to give the standard time for the task. Hutchinson (1963) pointed out criticisms of time study. It is slow, expensive, and the validity of the limited number of cycles making up the usual time study is questionable. This is especially valid when there may be as few as one or two observations made of an element during the study. He also noted the disagreement that centers on "consistency" and "validity." Consistency is

concerned with adhering to either prescribed course of action or in achieving a desired result. Validity deals with the ability of the techniques used to achieve this result.

Work Modules. A different approach to estimating dietary labor was devised by Brown (1969). In food production, time standards are a management tool. Often tasks, or steps, are repeated in different recipes, thus one standard measurement of labor, called a "module," may be established for each of these tasks.

Characteristics of modules were determined as follows:

1. There must be an established beginning and ending point.
2. The time does not vary for the constant module. An example given was assembling a grater.
3. The time will vary for the variable module with factors as batch size, weight, and specific product peculiarities affecting the time.
4. There may be more than one task in a module.

By use of time studies the labor time standards for food production are developed. Times are included for tasks, movements, distances traveled, batch sizes, raw ingredients, and personnel involved.

The modular approach to estimating dietary labor, as pointed out by Brown (1969), has a computer application. The modules for the recipes are input data. From this information it is possible to predict the required number of servings from menu selection data and the census as well as to determine the labor needed to produce a given number of servings of any menu item. Labor costs may then be computed to add to raw food costs

to determine total production costs. Brown noted, "Time standards serve as a means for standardizing procedures and techniques used in food production. Economy will dictate that improved utilization of labor is imperative."

Research of a similar nature was conducted by Ivanicky, et al. (1969) on the labor time needed for different steps in food production in relation to the number of servings being prepared. From this data the predicted time for preparation of other quantities might be determined and a time estimated for those recipes not studied.

The project involved 15 selected recipes in 5 different amounts and was concerned with preparation, panning, and cooking times. Assembling time was not included. Recipes were broken down into elements, an element being the smallest direction in the recipe. Each element was timed to the closest 0.05 minute. The elements in food production were classed as follows:

1. Elements in which production time is proportional to the number of portions produced. Individual handling was necessary.
2. Elements in which production time is practically independent of number of portions produced.
3. Elements in which production time is affected by but not proportional to the number of portions produced. Hand-mixed ingredients are included.

The elements most sensitive to portion increase are those in which individual handling is involved. The starting times for each recipe in a day's food production schedule can be calculated and printed by the computer. Each menu item will then be ready and served at the height of freshness. Since food

production times will be known, the cooks' schedules can also be calculated by the computer.

PROCEDURE

This study was based on the hypothesis that recipes can be broken down into processes that have a similarity. Certain processes are basic to all recipes. Time for preparing a menu item could be estimated by combining times for the individual processes involved.

Classification of Entrees

Selection and Grouping of Entrees. Dinner entrees served in the Kansas State University residence halls for a six-week period were listed (Table 1). These entrees were classified according to the following types: (1) ground, shaped mixture, (2) meat cubes in gravy or sauce, (3) portioned baked meat, fish, or poultry with or without sauce, (4) breaded and pre-breaded meat, fish, or poultry deep-fat fried, (5) grilled meat, and (6) roast meats. A total of 33 different entrees was served during the six-week period. An additional 18 entrees were added to make a more representative list and were designated with an asterisk.

Table 1. Residence hall dinner entrees classified according to type.

Type :	Characteristic	Menu item
1	Ground, shaped mixture	Ham loaf Meat loaf Meat balls Swedish meat balls Salmon loaf Chicken loaf Salisbury steak Ham balls* Salmon patties* Meat balls in tomato sauce*
2	Meat cubes in gravy or sauce	Brunswick stew Beef stew Beef stroganoff Southern roast beef stew Spaghetti with meat sauce Lamb stew* Braised beef cubes*
3	Portioned baked meat, fish, or poultry with or without sauce	Baked sole in tomato sauce Smothered steak Swiss steak Veal cutlets with cheese sauce Maryland chicken Baked pork chop Spareribs with sauerkraut Baked liver Thuringer with sauerkraut Baked grouper Barbecued ribs* Barbecued chicken* Scalloped of veal* Baked chicken*
4	Breaded and pre-breaded deep-fat fried meat, fish, or poultry	Breaded beef cutlet Pre-breaded chicken Pre-breaded perch Pre-breaded shrimp Veal Cordon Bleu Breaded pork cutlet* Breaded veal cutlet* Pre-breaded fish fillets*

Table 1 (concl.).

Type	Characteristic	Menu item
5	Grilled meat	Minute steak Flank steak* Ham slices* Liver* T-Bone steaks*
6	Roast meat or poultry	Baked ham Beef roast Pot roast of beef Pork loin roast Roast turkey Roast veal* Corned beef*

*Designates the entrees that were not served in the residence halls at Kansas State University during the specified six-week period.

Identification of Time Groups

Processes were categorized into four groups determined by the time at which preparation could be done. Scheduling of production could be balanced by advance preparation of foods that could be made early without lowering the quality. Four groups were defined according to the time in which each process could be completed.

Group A. Preparation of Ingredients. Processes that could be done in the 24-hour period preceding cooking without appreciably affecting the quality or nutritional value of a product were included in this group. The time of preparation is flexible and is not a critical factor in terms of cooking and serving time. If the product was to be frozen it could be

prepared in advance of the 24-hour period. By utilizing the concept that certain processes could be completed the day before serving an item, employees might be scheduled more advantageously. Some preparation could be done during slack periods, relieving the worker during peak periods. Examples of processes in this group include:

1. Chop Chicken or Vegetables. Chicken for Brunswick stew and chicken loaf was chopped by cooks with French knives. Vegetables such as green peppers, celery, and onions were chopped in the Hobart food chopper (model T-215).
2. Combine Ingredients. Meat mixtures were mixed in the Hobart mixer with a paddle attachment. Vegetables in the stew were manually combined by using a stainless steel paddle.
3. Grind Crumbs. An attachment was placed on the Hobart mixer. For small amounts the Hobart food chopper was used.
4. Pan. Uncooked roasts were placed in roasters ready for the oven, and portioned meats such as pork chops were placed on bun sheets.
5. Pan and Shape. An empty counter pan (12x20x4") was placed on a portable scale. The meat loaf mixture was weighed with the correct amount in each pan. The mixture was evenly distributed in the pan then divided into four loaves for baking. Meat balls were shaped with a number 16 dipper and placed in counter pans

(12x20x2") for baking.

6. Shred. Cheese for cheese sauce was shredded on the Hobart mixer with the shredder attachment.

Group B. Preparation for Cooking. Included in this group are those processes that must be done approximately 30 to 60 minutes prior to cooking.

1. Bread. Meat was dipped in seasoned flour, then in an egg-milk mixture and rolled in crumbs. This may be done in Group A and refrigerated until needed.
2. Grease, Flour, Pan. Portioned meat was dipped in seasoned flour, then placed on baking sheets. One cook greased the pans with a brush while another floured the meat. This too could be a time Group A process.
3. Open Cans or Cartons. Cans were opened with an electric can opener, and boxes of frozen fish were removed from case cartons.
4. Prepare Sauce. White sauce, gravy, tomato sauce for Swiss steak, and barbecue sauce were prepared in a 20-gallon steam jacketed kettle. (Time to obtain and measure ingredients was included in the time for performing this process.)
5. Slice. Potatoes for scalloped potatoes were sliced by placing an attachment on the Hobart mixer.
6. Take From Freezer or Storeroom. Case cartons of frozen vegetables or fish were taken from the storeroom. These two areas were on the same floor and in the general area of production.

7. To Vegetable Preparation Room. The vegetable preparation room was located on the lower level of the building. A cook went to the vegetable preparation room to get needed produce.

Group C. Cooking. This included the basic cooking processes.

1. Bake or Roast. The product was cooked in ovens with dry heat.
2. Braise. The meat was first browned in the steam jacketed kettle in a small amount of fat before liquid was added.
3. Deep Fat Fry. Product was cooked in an electric fryer in fat deep enough to cover it.
4. Grill. Meat was fried on the grill with a small amount of fat.
5. Simmer. The product was cooked in the steam jacketed kettle at a temperature of 185°F., as were the Type 2 entrees after the liquid was added.
6. Steam. Product was cooked by steam in compartmented stack steamer. Vegetables for stew were pre-cooked by this method.

Group D. Preparation for Serving. These are the processes that occurred just prior to serving.

1. Add Gravy or Sauce. Meat that was to be served with a gravy was removed from the baking sheets, placed in counter pans, and the gravy or sauce poured over it. Gravy was added to the cubed meat in the preparation

of stew, and some meat balls were served with gravy over them.

2. Cool and Prepare for Slicing. Roasts were cooled about 30 minutes before slicing. During this time cords on the tied roasts could be cut.
3. Cut or Slice. Meat loaf was cut manually by the cook. All roasts were sliced on the Hobart slicer (by one worker) and placed in counter pans (12x20x2"). Slices were weighed at random on a portion scale.
4. Heat. Meat that was covered with gravy was returned to the oven. The roast meat after slicing was returned to the oven to be heated for serving.
5. In and Out of Oven. Referred to the process of putting pans into and taking from the oven.

Observations

Location. Observations were made at Kramer Food Center, Kansas State University, to note time spent in the preparation of selected entree items. Three meals daily were served in Kramer Food Center to approximately 1200 women and men students. For the dinner meal the cafeteria service offered one entree (with less popular food, as liver, a choice was offered), one kind of potato, and a choice of two vegetables.

Three workers were responsible for preparation of the entree, potatoes, and vegetables for the evening meal. Their state Civil Service classifications were Institution Worker, Cook I, and Cook II. Cook II was the highest ranking of the

three and was responsible for directing the work of the others.

In a two-week period each employee worked 88 hours with one day off one week and two days off the alternate week. It would have been desirable to observe on days when the same three employees worked, but with their schedule and illness it was not possible. No observations were taken on weekends, as the number to be served was lower than week nights and, as a result, fewer cooks were needed. No mention was made to the employees that their work was being timed in the belief they would proceed at their own pace and not alter it for an observer.

Fresh vegetables were prepared for cooking in a separate area by workers other than those involved in the production of meals. The produce was washed and peeled, and when specified was cut into cubes, quarters, or sticks. An exception was slicing potatoes for escalloped potatoes which was done by the cooks in the food production area.

All equipment related to this study was located in the cooks' production area and included: one 20-gallon steam jacketed kettle, two 60-gallon steam jacketed kettles, two 3-deck stack steamers, three grills, two fryers, three 3-deck ovens, and three ovens under the grills.

Recording Form. A Process Time Sheet (Appendix) was devised for recording observations of time used by the three employees in the identified processes. The number of cooks and processes were listed according to the time groups previously identified (Group A, those processes that could be done in the 24-hour period preceding cooking; Group B, the processes done

prior to cooking; Group C, the cooking processes; and Group D, those processes that occurred prior to serving).

The wall clock in the cooks' unit was used for timing. The total time for each process included in an entree was timed from start to its completion. The span of time involved and total work time were computed. The production time span referred to the number of minutes needed from start of preparation of menu item until it was ready to be served. The amount of time each cook spent in preparation was recorded. The three cooks observed usually ate lunch from 11:00 to 11:30 and dinner from 4:10 to 4:40. The dinner time was not included in the total employee work time; however, the lunch time was included in the production time span. No timing was recorded for clean-up, unproductive activities, or time taken for getting pans and ingredients together.

Number of Observations. A total of 22 observations was made during a three-week period (Table 2). The variety of entrees offered during this time limited the total number of observations that were possible for each of the six types of entrees.

Table 2. Number of observations of entree preparation.

No.:	Entree	Menu item	Observations	
	Type		No. for each item	Total for type
1	Ground, shaped mixture	Meat Loaf	3	
		Meat Balls	2	5
2	Meat cubes in gravy or sauce	Beef Stew	1	
		Brunswick Stew	1	
		Spaghetti with Meat Sauce	1	3
3	Portioned baked meat, fish, or poultry with or without sauce	Smothered Steak	2	
		Swiss Steak	1	3
4	Breaded and pre-breaded deep fat fried meat, fish, or poultry	Breaded Cutlet	1	
		Pre-breaded Shrimp	1	2
5	Grilled meat	Minute Steak	1	
		T-Bone Steak*	1	2
6	Roast meat	Roast Beef	2	
		Baked Ham	2	
		Roast Pork	2	
		Turkey Rolls	1	7

*This observation was made at a later time as only one grilled item appeared on the menu during this period.

RESULTS AND DISCUSSION

Process Time

Process time, as shown in Table 3, represents the total time required to complete a process. The number of minutes spent by each cook was combined to give the process total. When more than one observation was made an average was computed. Individual Time Process Sheets are included in the Appendix.

Type 1. Ground, Shaped Meat Mixtures. Preparation of two menu items for this type was observed. Three observations were made for meat loaf and two for meat balls. As noted in Table 3, the combining, panning, and shaping for the meat loaves took an average of 323 minutes as compared to 665 minutes for Swedish meat balls and 655 minutes for the plain meat balls. The greatest amount of employee work time occurred in time Group A and thus could have been done the day prior to serving. In the observations for this study the processes were all done the day the product was served. The time required to combine the ingredients varied little between meat loaf and meat ball preparation. Most of the time difference occurred between panning and shaping the loaves and dipping and shaping the meat balls.

Time expended for processes in time group D (preparation for serving) was comparable for meat loaf and Swedish meat balls. It appeared that the processes of cutting meat loaf and adding gravy to the Swedish meat balls (including time to put pans in and take from the oven) took relatively the same amount of time. When no gravy was added to the meat balls the labor time of

Table 3. Average process time for selected entrees.

Time group	Type 1		
	Meat loaf	Meat balls	Swedish meat balls
	Min.	Min.	Min.
A. Preparation of Ingredients			
Chop chicken or vegetables	22	20	20
Combine ingredients	78	75	75
Grease, flour, pan			
Grind crumbs	23	20	15
Pan and shape	200	540	555
Shred			
Total	<u>323</u>	<u>655</u>	<u>665</u>
B. Preparation for Cooking			
Bread			
Combine ingredients			
Open cans - cartons			
Pan			
Preparation of sauce			25
Take from freezer - storeroom			
Slice			
To veg. prep. room			
Total			<u>25</u>
C. Cooking			
Bake			
Braise			
Deep-fat fry			
Grill			
Simmer			
Steam			
Total			
C. Preparation for Serving			
Add sauce			70
Cool			
Cut - slice	112		
Heat			
In and out of oven		50	40
Transfer to counter pans			
Total	<u>112</u>	<u>50</u>	<u>110</u>
Total	<u>435</u>	<u>705</u>	<u>800</u>
Number of observations	3	1	1

Table 3 (Cont.).

Time group	Type 2		
	Beef stew Min.	Brunswick stew Min.	Spaghetti with meat sauce Min.
A. Preparation of Ingredients			
Chop chicken or vegetables		160	20
Combine ingredients			
Grease, flour, pan			
Grind crumbs			
Pan and shape			
Shred			
Total		<u>160</u>	<u>20</u>
B. Preparation for Cooking			
Bread			
Combine ingredients			
Open cans - cartons			
Pan	15	15	
Preparation of sauce	25	35	40
Take from freezer - storeroom			
Slice			
To veg. prep. room	<u>10</u>	<u>10</u>	<u>40</u>
Total	50	60	
C. Cooking			
Bake			
Braise	20		30
Deep-fat fry			
Grill			
Simmer	45	60	45
Steam			<u>155</u>
Total	<u>65</u>	<u>60</u>	<u>230</u>
D. Preparation for Serving			
Add sauce	40	30	
Cool	40	40	
Cut - slice			
Heat			
In and out of oven			
Transfer to counter pans			
Total	<u>80</u>	<u>70</u>	
Total	<u>195</u>	<u>350</u>	<u>290</u>
Number of observations	1	1	1

Table 3 (Cont.).

Time group	Type 3		:	Type 4	
	Smothered steak	Swiss steak	:	Pre- breaded shrimp	Breaded cutlet
	Min.	Min.		Min.	Min.
A. Preparation of Ingredients					
Chop chicken or vegetables					
Combine ingredients					30
Grease, flour, pan	270	320			
Grind crumbs					20
Pan and shape					
Shred					
Total	<u>270</u>	<u>320</u>			<u>50</u>
B. Preparation for Cooking					
Bread					640
Combine ingredients					
Open cans - cartons				15	
Pan					
Preparation of sauce	27	40			
Take from freezer - storeroom				10	
Slice					
To veg. prep. room					
Total	<u>27</u>	<u>40</u>		<u>25</u>	<u>640</u>
C. Cooking					
Bake					
Braise					
Deep-fat fry				190	210
Grill					
Simmer					
Steam					
Total				<u>190</u>	<u>210</u>
D. Preparation for Serving					
Add sauce	42	40			
Cool					
Cut - slice					
Heat					
In and out of oven	42	40			
Transfer to counter pans	<u>37</u>	<u>40</u>			
Total	<u>121</u>	<u>120</u>			
Total	<u>418</u>	<u>480</u>		<u>215</u>	<u>900</u>
Number of observations	2	1		1	1

Table 3 (Concl.).

Time group	Type 5		Type 6			
	Minute	T-Bone	Beef	Pork	Ham	Turkey
	steak	steak	roast	roast	rolls	rolls
	Min.	Min.	Min.	Min.	Min.	Min.
A. Prep. of Ingredients						
Chop chicken or vegetables						
Combine ingredients						
Grease, flour, pan						
Grind crumbs						
Pan and shape			90	97		90
Shred						
Total			90	97		90
B. Prep. for Cooking						
Bread						
Combine ingredients						
Open cans - cartons						
Pan						
Prep. of sauce						
Take from freezer - storeroom						
Slice						
To veg. prep. room						
Total						
C. Cooking						
Bake						
Braise						
Deep-fat fry						
Grill	295	330				
Simmer						
Steam						
Total	295	330				
D. Prep. for Serving						
Add sauce						
Cool			42			
Cut - slice			215	210	162	210
Heat						
In and out of oven			75	80	45	70
Transfer to counter pans						
Total			332	290	207	280
Total	295	330	422	387	207	370
Number of observations	1	1	2	2	2	1

time group D was about cut in half; only 25 minutes were needed from each of the two workers.

Type 2. Meat Cubes in Gravy or Sauce. Preparation of three menu items was observed, one for beef stew, one for Brunswick stew, and the third for spaghetti with meat sauce. This type of entree, as can be seen from Table 3, has a fairly even distribution of labor time between the four time groups. Though the preparation of vegetables for the stews was a Type A process, vegetable preparation was not the responsibility of workers in this study so was not included. The most time consuming process in Group A was that of chopping chicken for the Brunswick stew, which in this case was frozen chicken pieces. Time could have been reduced had diced chicken been purchased.

In time group B, the 15 minutes for panning refers to the time needed to put the vegetables in steamer pans and into the steamers for partial cooking prior to combining with meat and gravy. Though preparation of the thickening for the two types of stews was nearly the same, a slightly longer time was needed to prepare the meat sauce for the spaghetti.

In time group C, 45 minutes labor time was needed to stir the meat while it browned. This time was dovetailed with other tasks the cook was performing. A longer length of time was needed for cooking the spaghetti because of the necessity for occasional stirring. In the one observation made, the three cooks took a combined time of 155 minutes.

Time group D was mainly involved with adding the gravy or sauce to the meat and combining the vegetables. The cooks did

not transfer these items to the counter pans; it was done by the supply boy.

Type 3. Portioned Baked Meat, Fish, or Poultry with or without Sauce. For this type entree three observations were made--two of smothered steak and one of Swiss steak. The most time-consuming processes, as shown in Table 3, were those in time group A. Meat portions were floured and placed on greased bun pans. A total of 270 minutes for the smothered steak and 320 for Swiss steak was required to complete this process. Processes in time group B entailed very little of the workers' time, only the time involving one cook in the preparation of the sauce.

There was, however, considerably more time demanded of the workers for the time group D processes. Meat portions were transferred from bun pans to counter pans, gravy was added, and pans were returned to the oven, taking a total of 120 minutes. Again these processes were dovetailed with other activities which made accurate timing difficult.

Type 4. Breaded and Pre-Breaded Deep-Fat Fried Meat, Fish, or Poultry. One pre-breaded item and one item which the cooks breaded were observed as examples of foods of this type.

Pre-breaded shrimp, as noted in Table 3, required no preparation and involved no cooks' time, except to take the cartons from the freezer and open them, until the actual cooking process (time group C) began. This was a continuous operation. As the shrimp was cooked it was placed in counter pans and the fryer baskets filled again.

A much greater portion of the employee time was used when food was breaded; the greatest amount was utilized in the bread-ing process. Several steps in this process make it time consuming--the necessity for flouring portions, dipping them in egg-milk mixture, and rolling in crumbs. A total of 640 minutes was used for this process. When this observation was made the breading was done the day the item was to be served; however, it could be breaded the day prior to serving, which would make it a Group A process.

The meat was placed in the fryer and browned, then put in counter pans and placed in the ovens to heat. The continuous processes of time groups C and D--frying, panning, and putting into the oven--took 210 minutes.

Type 5. Grilled Meat. Two menu items, T-Bone steaks and minute steaks, were observed. As shown in Table 3, the only process involved was grilling in time group C; very little time was taken to get the meat from the cooler and as it was dovetailed with other tasks it was difficult to time accurately. Once started this was a continuous operation.

Type 6. Roast Meat. The processes involved were basically the same whatever kind of meat was being roasted. In time group A, (Table 3), the roasts were panned and refrigerated the day prior to roasting.

Preparation for serving time group D required most of the employee time. Boned and rolled beef roast was observed. After the roasts were removed from the oven, they were cooled and one cook cut and removed the cords to ready the roast for slicing.

The most involved process for this type entree was the slicing which took approximately 200 minutes. Turkey rolls and ham rolls could be sliced while the meat was chilled prior to cooking. This process could be done partly or completely in time group A. In the observations made of the baked ham a portion of the slicing was done the day prior to being served.

After slicing, the meat was placed in counter pans and returned to the oven to heat. Time varied from 40 minutes for the rolls to 70, 75, and 80 for the roasts.

Total Time Span and Total Labor Time

The total time span was computed from the start of preparation of the menu item until serving time. The amount of time expended by each worker involved in the preparation was recorded as was the total amount of labor time. For some entree types there was little variation in the total time span, while a larger difference in the total labor time was noted. Preparation was generally started at the same time regardless of the number of workers involved; however, with fewer workers more concentrated labor time on that specific menu item was necessary.

While it is essential that there be enough workers to assure having the product ready in the allowed time span, the number needed will depend on the total amount of food to be prepared. For this study, 1,200 persons were served; with a small number, fewer workers could accomplish the preparation in a shorter time span.

Type 1. Ground Shaped Meat Mixtures. The total time span for the meat loaf and the two kinds of meat balls was similar (Table 4). The preparation for both menu items started at the same time. The meat loaves required a longer baking time but less time for shaping than the meat balls.

The total labor time for three cooks for the Swedish meat balls was almost double that of the meat loaf and required 100 minutes more than were needed for the plain meat balls. Preparation of the gravy and its addition to the meat balls accounted for the difference in time for preparing the Swedish meat balls and the plain meat balls.

Type 2. Meat Cubes in Gravy or Sauce. The time span observed for both the Brunswick stew and spaghetti with meat sauce was the same (Table 4). The longer time span for the beef stew was necessary as the cubed beef was a less tender cut of meat and required a longer cooking time.

The preparation time for the Brunswick stew was 350 minutes. It was the cutting of the chicken pieces that made the preparation time for this menu item so much more than for the other two items observed. The time involved in cooking the spaghetti accounted for the approximately 100 minutes more needed for this menu item as compared to the beef stew.

Type 3. Portioned Baked Meat, Fish, or Poultry with or without Sauce. As indicated in Table 4, the total time span was nearly equal for the Swiss steak and the smothered steak. The total amount of preparation time was 418 minutes for the smothered steak and 480 minutes for Swiss steak. Had the same

Table 4. Total production span and labor time.

Type	Menu items	Number observa- tions	Inst. worker	Cook I	Cook II	Total	Total time span*
			Min.	Min.	Min.	Min.	Min.
1	Meat loaf (average)	3	169	100	166	435	300
	Meat balls	1	220	195	290	705	315
	Swedish meat balls	1	260	210	330	800	315
2	Beef stew	1	65		130	195	205
	Brunswick stew	1	140		210	350	195
	Spaghetti with meat sauce	1	95		195	290	195
3	Smothered steak (average)	2	175	115	128	418	295
	Swiss steak	1	200	-	280	480	315
4	Breaded beef cutlets	1	260	360	280	900	315
	Pre-breaded shrimp	1	-	160	55	215	30
5	Grilled minute steak	1	120	70	105	295	60
	Grilled T-Bone steak	1	165	165	-	330	75
6	Roast beef (average)	2	215	150	57	422	345
	Roast pork (average)	2	210	97	80	387	375
	Ham rolls (average)	2	67	140	-	207	210
	Turkey rolls	1	210	90	70	370	345

*Time from start of preparation to serving.

number of cooks been working on each of the menu items, it would appear the total preparation time would be comparable.

Type 4. Breaded and Pre-Breaded Deep-Fat Fried Meat, Fish, or Poultry. The production time span for the breaded portions, as shown in Table 4, was 315 minutes. This was the result of the lengthy process of breading; had this been a time group A process, the total time span would have been reduced. In this particular observation it would have been reduced 150 minutes.

As a contrast the pre-breaded shrimp had a very short production time span. Frying of the product was begun just 30 minutes prior to the start of serving.

The same contrast in total labor time is apparent in the two types of menu items. The item breaded by the cooks took 900 minutes as compared with only 215 minutes for the pre-breaded item. In the latter, two workers were used while three were needed for the breading.

Type 5. Grilled Meat. The total time span for the T-Bone steaks (75 minutes) was only slightly longer than for the minute steaks, which was 60 minutes, because of longer cooking time. Three cooks grilled the minute steaks for a total of 295 minutes, while two workers grilled the T-Bone steaks in 330 minutes. With fewer cooks working it was necessary that each one work for a longer period of time.

Type 6. Roast Meat. The total time span, as seen in Table 4, was longest for the roast pork as it required a longer time to cook, while conversely, the ham had the shortest time

span as it was precooked and needed only to be heated.

The roast beef took more preparation time from the three cooks than the other roasts. As noted previously, this was in part due to the longer time involved in handling the roasters and for the time needed to ready the boned rolled roasts for slicing. The ham rolls took the least amount of time as the only process needed was slicing, and the rolls sliced more easily than did the roasts.

Variations of Observed Entrees

This study was based on the hypothesis that recipes are made up of processes that may have a similarity. Menu items offered at Kramer Food Center but that were not on the menu during the observation period were reviewed to note processes involved and how they fit into the identified time groups and types of entrees.

Type 1. Ground, Shaped Meat Mixtures. In general, time factors for preparation of basic meat loaf should apply to any variety of meat mixture made into a loaf. Chicken or salmon loaf also would be similar except that accurate timings on preparing the chicken or salmon would be necessary.

This information, when combined with time for dipping and shaping meat balls, could provide the estimate of production time for salmon or chicken patties.

Meat balls in tomato sauce would have a comparable production time span to Swedish meat balls. Rather than a meat stock gravy, a sauce much like the one observed for preparation of

Swiss steak would be used.

Ham balls should have the same time span as plain meat balls, the only difference being the kind of meat used. Though salisbury steak has some processes that are the same as for meat balls, timings of the dipping process would be needed as a serving consists of only one piece of meat rather than two as for meat balls. The method of cooking also could be a variable, as the meat might either be grilled or baked.

Type 2. Meat Cubes in Gravy or Sauce. In the Type 2 entree the meat which could be ground or cubed was browned, liquid added, then simmered. Varieties of stew, such as southern roast beef stew and lamb stew, should have process times that are the same as those for beef stew. By eliminating the processes involving vegetables, the remaining steps would be similar to those in braised beef and beef stroganoff. Time for cooking noodles should be the same as for cooking spaghetti.

Type 3. Portioned Baked Meat, Fish, or Poultry with or without Sauce. Portioned baked meat, as chicken, pork chop, or veal cutlet, would have process times similar to the observations for Type 3. The process of preparing the sauce for veal cutlets in cheese sauce or Maryland chicken should be similar for any recipe in which a sauce would be used. Time must be included for shredding cheese. Timings would be necessary for panning chicken since its irregular shape may take an amount of time different from a portioned chop or steak.

Items as barbecued chicken and barbecued ribs could be likened to Swiss steak--a baked meat with the addition of tomato sauce.

Type 4. Breaded and Pre-Breaded Deep-Fat Fried Meat, Fish, or Poultry. The breading process should require the same amount of time for any variety of meat, fish, or poultry. Other processes involved in this type menu item should be similar. Any pre-breaded item would have a production time span much like the one observed.

Type 5. Grilled Meat. Processes involved in grilling any meat item, as ham, steak, or liver, would be the same as for those observed. Time required to cook different kinds of meat would vary and timings would be necessary.

Type 6. Roast Meat. Processes and times involved were basically the same whatever kind of meat was roasted.

One meat that has not been mentioned in the previous types is corned beef. This could be likened to the process in the Type 2 entree when the meat was placed in the steam-jacketed kettle and simmered. After cooking, the meat was removed and cooled. Slicing would be the same as for other roasts. The sliced meat would be placed in counter pans ready for serving.

CONCLUDING STATEMENTS AND RECOMMENDATIONS

The objective of this preliminary investigation was to develop a procedure for estimating time factors in entree preparation. The procedure was based on the premise that a recipe could be broken down into processes that would be building blocks of a recipe. This study indicated general time relationships existed between the various processes involved in the preparation of dinner entrees. Additional observations would be

needed to establish valid and reliable process times. The time required for getting materials together, counting pans, and clean-up should be included also to give complete and accurate data. The process in and out of oven was difficult to time, since it was dovetailed with other processes.

From the work that was done, it would appear that the concept of estimating preparation time on the basis of known process times would be feasible. Time processes would vary for each food service organization depending on its personnel, available equipment, and number served. To develop a complete system, other types of recipes should be included.

Established process times could be placed on the recipe card. This would provide helpful information for planning menus and scheduling workers. For computer-planned menus, more detailed data would be required including that of equipment, its kind, size, and usage.

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APPENDIX

Table 5. Process time sheet for Type 1 menu items.

Time groups	No. cooks	Meat loaf			Meat balls			Swedish meat balls		
		Min.	Min.	Ave.	Min.	Min.	Ave.	Min.	Min.	Min.
A. Prep. of Ingredients										
Chop chicken - veg.	1	20	25	22	20	20	22	20	20	20
Combine ingredients	1	80	80	78	75	75	78	75	75	75
Grease, flour, pan										
Grind crumbs	1	20	25	23	25	20	23	15	15	15
Pan and shape	2	200	200	200	200	540*	200	555*	555*	555*
Shred										
B. Prep. for Cooking										
Bread										
Combine ingredients										
Open cans - cartons										
Pan										
Prep. of sauce	1									25
Take from freezer storeroom										
Slice										
To veg. prep. room										
C. Cook										
Bake (span)		210	210	210	210	210	210	210	210	210
Braise										
Deep-fat fry										
Grill										
Simmer										
Steam										
D. Prep. for Serving										
Add sauce	2									70
Cool										
Cut - slice	2	120	115	112	102	112	112			
Heat										
In and out of oven								50		40
Transfer to counter pans										
Total Time		440	445	435	422	435	435	705		800

*Three cooks.

Table 6. Process time sheet for Type 2 menu items.

Time groups	No. cooks	Beef stew Min.	Brunswick stew Min.	No. cooks	Spaghetti with meat sauce Min.
A. Prep. of Ingredients					
Chop chicken - veg.	2		160	1	20
Combine ingredients					
Grease, flour, pan					
Grind crumbs					
Pan and shape					
Shred					
B. Prep. for Cooking					
Bread					
Combine ingredients					
Open cans - cartons					
Pan	1	15	15		
Prep. of sauce	1	25	35		40
Take from freezer storeroom					
Slice					
To veg. prep. room					
C. Cook					
Bake					
Braise (span of 195 min.)	1	20			30
Deep-fat fry					
Grill					
Simmer - stirring time	1	45	60		45
Spaghetti	2				155
D. Prep. for Serving					
Add sauce	2	40	30		
Combine	2	40	40		
Cut - slice					
Heat					
In and out of oven					
Transfer to counter pans					
Total Time		195	350		290

Table 7. Process time sheet for Type 3 menu items.

Time groups	No. cooks	Smothered steak Min.	Smothered steak Min.	Average Min.	Swiss steak Min.
A. Prep. of Ingredients					
Chop chicken - veg.					
Combine ingredients					
Grease, flour, pan	3	240	300*	270	320*
Grind crumbs					
Pan and shape					
Shred					
B. Prep. for Cooking					
Bread					
Combine ingredients					
Open cans - cartons					
Pan					
Prep. of sauce	1	30	25	27	40
Take from freezer storeroom					
Slice					
To veg. prep. room					
C. Cook					
Bake (span of 240 min.)					
Braise					
Deep-fat fry					
Grill					
Simmer					
Steam					
D. Prep. for Serving					
Add sauce	1	45	40	42	40
Cool					
Cut - slice					
Heat					
In and out of oven	2	40	45	42	40
Transfer to counter pans	2	40	35	37	40
Total Time		395	445	418	480

*Two cooks.

Table 8. Process time sheet for Type 4 menu items.

Time groups	No. cooks	Pre-breaded shrimp Min.	Breaded beef cutlet Min.
A. Prep. of Ingredients			
Chop chicken - veg.			
Combine ingredients	1		30
Grease, flour, pan			
Grind crumbs	1		20
Pan and shape			
Shred			
B. Prep. for Cooking			
Bread	3		640
Combine ingredients			
Open cartons	1	15	
Pan			
Prep. of sauce			
Take from freezer storeroom	1	10	
Slice			
To veg. prep. room			
C. Cook			
Bake			
Braise			
Deep-fat fry	2	190	180
Grill			
Simmer			
Steam			
D. Prep. for Serving			
Add sauce			
Cool			
Cut - slice			
Heat (span of 180 min.)			
In and out of oven			30
Transfer to counter pans			
Total Time		215	900

Table 9. Process time sheet for Type 5 menu items.

Time groups	No. cooks	Minute steak Min.	No. cooks	T-Bone steak Min.
A. Prep. of Ingredients Chop chicken - veg. Combine ingredients Grease, flour, pan Grind crumbs Pan and shape Shred				
B. Prep. for Cooking Bread Combine ingredients Open cans - cartons Pan Prep. of sauce Take from freezer storeroom Slice To veg. prep. room				
C. Cook Bake Braise Deep-fat fry Grill Simmer Steam	3	295	2	330
D. Prep. for Serving Add sauce Cool Cut - slice Heat In and out of oven Transfer to counter pans				
Total Time		295		330

Table 10. Process time sheet for Type 6 menu items.

Time groups	No. : cooks :	Roast : beef : Min.	Ave. : Min.	Roast : pork : Min.	Ave. : Min.	Ham : Min.	Tur- key : Min.
A. Prep. of Ingredients							
Chop chicken - veg.							
Combine ingredients							
Grease, flour, pan							
Grind crumbs							
Pan	1	90	90	100	95		90
Shred							
B. Prep. for Cooking							
Bread							
Combine ingredients							
Open cans - cartons							
Pan							
Prep. of sauce							
Take from freezer storeroom							
Slice							
To veg. prep. room							
C. Cook							
Bake (span)		360	360	390	390		330
Braise							
Deep-fat fry							
Grill							
Simmer (span)							
Steam							
D. Prep. for Serving							
Add sauce							
Cool (cut cords)	1	45	40				
Cut - slice	1	220	210	195	225	165	210
Heat							
In and out of oven	1	80	70	85	75	45	70
Transfer to counter pans							
Total Time		435	410	380	395	210	370

TIME FACTORS IN PREPARATION OF SELECTED ENTREES

by

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AN ABSTRACT OF A MASTER'S REPORT

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This study was a preliminary investigation of menu preparation related to a residence hall food service. The objective was to develop a procedure for estimating time factors in entree preparation that could be programmed for the computer. The basis for the study was the hypothesis that recipes can be broken down into processes that have a similarity.

Dinner entrees for a six-week period at the Kansas State University residence halls were classified according to the following types: (1) ground, shaped mixture, (2) meat cubes in gravy or sauce, (3) portioned baked meat, fish, or poultry with or without sauce, (4) breaded and pre-breaded meat, fish, or poultry deep-fat fried, (5) grilled meat, and (6) roast meats. Processes basic to the preparation of these entrees were identified and defined. The identified processes were categorized into four groups determined by the time preparation could be done. Group A included processes that could be done in the 24-hour period preceding cooking without affecting the quality or nutritional value of the product. Group B included processes done 30 to 60 minutes prior to cooking. Cooking processes were in group C. Group D included processes that occurred prior to serving.

Preparation of selected menu items from each type were observed and process times recorded. Total preparation time was computed and total time span from beginning of preparation to serving was determined.

Based on this limited study, the concept of estimating preparation time on the basis of known process times would be

feasible. Additional observations would be needed to establish valid and reliable process times. This could provide helpful information for planning menus or scheduling workers, and in preparation for computer-planned menus.