MEASURING PRODUCTIVITY AND SIX OTHER INTER-RELATED ORGANIZATIONAL PERFORMANCE CRITERIA IN HEALTH CARE DELIVERY SYSTEMS

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INTRODUCTION

Most foodservice operators do not understand what a standard productivity measure is or how it can be used; they misinterpret the implications of poor performance or superior performance, and use labor cost ratios (dollars labor cost divided by dollar sales) as productivity measures (Freshwater and Bragg, 1975). Heaton (1977) states that in non-profit organizations, budgets are authorizations to incur costs without measuring of the results to be achieved. Since foodservice operations are only about half as productive as other industries, one must wonder whether this problem emanates from poor management or from poor measurement.

Identification of the Problem

In 1980, the cost of meals served in healthcare institutions rose 7.9% over 1979 figures. Costs will continue to rise in all areas of healthcare in the future, with no concurrent rise in profits due to the increase in chronic illness as the population over age 65 continues to increase (Annual Report: Health Care, 1982). These patients require more expensive special diets and care. With third party payments now comprising 90% of the hospital bill (these include Medicare, Medicaid, and private insurance companies), there is a strong influence on hospitals by the government and private sector to contain

costs. The ubiquitous pressures on hospital administrators to control costs while maintaining high levels of service lead hospital spokespersons to believe that society expects the highest quality of service at the lowest cost (Smalley and Freeman, 1966). Obviously, this is not possible. There is a point at which output quantity could be high enough that quality of food and service and employee satisfaction would have to be sacrificed (Ruf, 1975). A compromise is necessary; this can be accomplished only by maintaining high levels of productivity.

Purpose of the Research

Management consists of the following functions:

1. Planning - deciding what to do
2. Organizing - deciding how to do it
3. Leading - directing performance
4. Controlling - evaluating performance
5. Adapting - deciding what should be changed

Szilagyi (1981) lists as performance criteria by which an organization may be evaluated and controlled--effectiveness, productivity, efficiency, profit, quality, safety, growth, attendance, retention, satisfaction, motivation, innovation, adaptability, and development. Sink (1983) shortens this list to include effectiveness, efficiency, productivity, profitability, quality, innovation, and quality of worklife (which would include the other factors listed by Szilagyi). Not all of these criteria are appropriate for all organizations. In her study of productivity in hospital trayline areas, Robertson (1980) found that productivity measures used by dietitians and supervisors in

hospitals were actually indicators of other performance criteria such as effectiveness or efficiency or indexes of related functions such as absenteeism or turnover (both of which are part of the quality of worklife). To clear up the confusion associated with each of these criteria and work toward more standardized indicants of each, and in order to facilitate future industry comparison, it becomes necessary to assess how managers currently define and measure each. This study does so within hospital and restaurant foodservice.

The research will focus on the measures currently being used by members of the American Dietetic Association and the National Restaurant Association. As a follow-up to Robertson's (1980) research, ratios and indexes currently used by these managers will be examined for validity in measuring productivity. Are managers measuring productivity, or in fact one of the related performance criteria delineated by Sink (1983a)? If they are measuring inputs and outputs, are they developing ratios and indexes by which to evaluate their operations?

Objectives of the Study

The objectives of this research include:

1. To identify current organizational performance evaluation methods in the hospital foodservice industry.

2. To identify demographic variables which affect the measures currently utilized.

3. To determine the relative importance of each criteria based on the foodservice professional's perceptions and on the time spent evaluating them.

Assumptions and Limitation of the Study

The following assumptions and a limitation are accepted for this study:

1. Foodservice managers surveyed will have sufficient knowledge of productivity measurement after reading the definitions and examples given in the questionnaire to complete the questionnaire.

2. Assessment of the aforementioned variables for the operation will be within the realm of duties of the manager in his/her current position.

3. Membership in the American Dietetic Association and the practice group (ADA members with management responsibilities in healthcare delivery systems) are not mutually exclusive.

A limitation of the study is that the sample surveyed may or may not be representative of the population.

Definition of Terms

Productivity. The ratio of quantities of outputs to quantities of inputs. These outputs and inputs must be for the same unit of time (APC, 1979).

Productivity Measurement. The selection of physical, temporal, and/or perceptual measures for input variables and output variables and the development of a ratio of output measure(s) to input measure(s).

Productivity Index. A ratio divided by itself. A basic period is used and another period compared to it. The productivity index shows the change in productivity over time.

Productivity Ratio. The comparison of two variables of single parameters (i.e., labor and labor, hours and hours), or of several parameters such as net outputs when several inputs are required (Mali, 1978).

Partial Factor Productivity Ratio. A productivity ratio which includes most, or all, of the outputs and some (generally one type) of inputs.

Total Factor Productivity Measurement. Those measures which relate output to all input factors involving the weighting together of the quantities of separate factors. (Capital and labor may be aggregated using their unit costs in a base year as weights).

Effectiveness. The degree of achievement of objectives (Smalley and Freeman, 1966).

Efficiency. An input issue--resources expected to be consumed over resources actually consumed (Sink, 1983a).

Quality. The degree to which the system conforms to, specifications, (Sink, 1983a), or at the consumer level, fitness for use.

Quality of Worklife. Work with meaning (Mali, 1978), or affective responses to working in and living in organizational systems (Sink, 1983a).

Profitability. The earned return on investment (owner equity) or the return on all things a business owns (Rausch, 1982), or the relationship of revenue to costs.

Innovation. A deliberate, novel, specific change aimed at accomplishing the goals of the system more effectively (Mueller, 1971), or applied creativity.

CHAPTER II

REVIEW OF LITERATURE

The purpose of managerial control is to compel events to conform to plans (Goetz, 1949). According to Koontz and O'Donnell (1968), this is done by establishing standards, measuring performance against these standards, and correcting deviations from standards and plans. This study focuses on the measurement of performance and seeks to assess if standards are being set and used in foodservice for each of the criteria previously mentioned. Although it is not always possible to evaluate the criteria quantitatively (as in the case of innovation), some form of control for each criteria is necessary. Koontz and O'Donnell (1968) state that controls:

1. must reflect the nature and needs of the activity
2. should report deviations promptly
3. should be forward looking
4. should point up exceptions at critical points
5. should be objective
6. should be flexible
7. should reflect the organizational pattern
8. should be economical
9. should be understandable
10. should indicate corrective action (p. 643).

The interrelationship between the performance criteria can be seen in

Figure 1. These criteria are not mutually exclusive. Effectiveness is often evaluated in terms of quality, quantity, and timeliness. The quality of worklife (job satisfaction, motivation) affects productivity, quality, and efficiency. Such factors as adequate goal setting (effectiveness), amount of rework necessary (quality), and technological advances (innovation) can greatly affect productivity. Productivity and profitability often go hand in hand, but this is not always the case.

This chapter defines and discusses each of the seven criteria in detail, relates each to productivity, and seeks to eliminate the ambiguity which exists concerning performance evalution.

Effectiveness

Unlike some of the other performance criteria, evaluation of effectiveness is applicable to both service and manufacturing industries, profit, and non-profit organizations. Szilagyi (1981) defines effectiveness as the degree to which the goals of the organization are met, while Drucker (1974, p. 45) calls it simply "doing the right things." Katz and Kahn (1971) who have written extensively about organizational effectiveness, state that it is the maximization of return to the organization by economic and technical means (efficiency) and by political means (making and engineering of choices on grounds other than economics and efficiency in an open market). Other authors such as Yuchtman and Seashore (1967) relate effectiveness to the exploitation of the environment. In his study of 17 commonly accepted models of organizational effectiveness, Steers (1975) found that the following criteria appeared most often: adaptability,

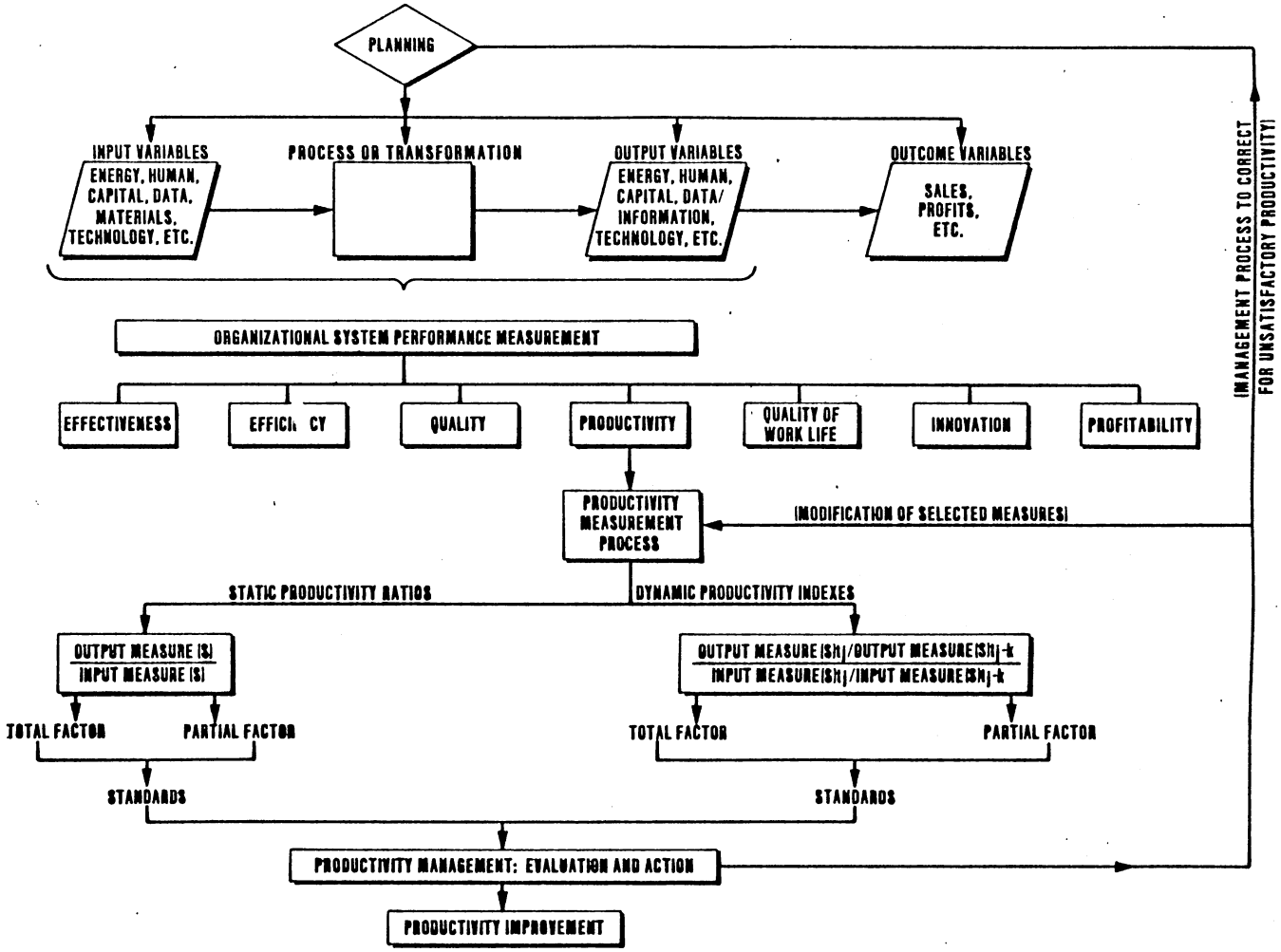


Figure 1. The Productivity Management Process

flexibility, productivity, satisfaction, profitability, resource acquisition, absence of strain, control over environment, development, efficiency, employee retention, growth, integration, open communications, and survival. Steers himself sees effectiveness as how well an organization acquires and utilizes its resources efficiently in a changing environment. If the degree of goal attainment must be known to appraise effectiveness, the first step toward effectiveness is the development of concise, attainable goals. Then, a system of control must be developed in order to track progress.

Measurement

The mark of a good effectiveness measure is that it closely reflects the objective (Quade, 1982). Organizations often measure the effectiveness of any program, operation, and task in terms of costs incurred without regard for the benefits derived. True benefits are difficult to quantify and Quade warns that managers must not be prejudiced by what they think is measurable, but must set out from the standpoint of what they want to measure.

Because effectiveness is difficult to assess, more easily appraised surrogate measures are often used. Growth and decline, survival, adaptability, production, turnover, absenteeism, member satisfaction, and client satisfaction are such surrogate measures (Katz and Kahn, 1971). Some of these may be appropriate for certain organizations and totally inappropriate for others; i.e., the evaluation of profitability per se, as a determinant of effectiveness in a non-profit organization.

There are three elements of effectiveness: quantity, quality, and timing. Etzioni (1960) states that effectiveness is utilization of resources as efficiently as possible. This often presents a problem in service organizations such as hospitals. The most effective treatment is not always the most efficient; indeed, concentration on efficiency in such a setting could be detrimental to the health of the patient. Yet, Heaton (1977) states that the efficiency with which resources are utilized and the effectiveness of services are important in service organizations. He makes the distinction between the manufacturing sector where effectiveness is controlled through competition in the marketplace (goods sell only if they are effective in meeting consumers' demands) and service organizations where managers are dealing not with the aggregate demands of a population but with individual responses.

Any measure of effectiveness must be specific to that particular organization. This often causes problems in academic and political circles and with funding sources. How can decisions on funding be made if the effectiveness of organizations cannot be compared (Numeroff, 1982)? Steers (1975) states that more flexible comprehensive models are needed for the evaluation of effectiveness. Complicating the evaluation issue is the fact that often, judgmental evaluation is used for effectiveness. A manager feels that the organization is functioning more smoothly than it was previously; therefore, he thinks he has been effective. Quade (1982) states that the major problems in the measurement of effectiveness in the public sector are: (1) benefit measurement, both technical and conceptual blocks are encountered; (2) the unavailability of data, poor quality of data, or the inability

to aggregate data collected; (3) benefits of government expenditures are not reflected in the marketplace; and (4) benefits and costs often go to different people. He cautions against measuring effectiveness as costs (inputs and outputs are often confused in doing this), workload measures (patient days per year in a hospital tells one nothing about whether the hospital was effective in restoring patients to health), and common index of worth (which generally ends up being dollars expended). Effectiveness can be assessed in terms of its contribution to the efficiency, survival, power, and environmental control of the entire societal system (Katz and Kahn, 1971).

The following problem areas in the measurement of effectiveness are delineated by Steers (1975):

1. Construct validity
2. Criterion stability
3. Time perspective
4. Multiple criteria
5. Precision of measurement
6. Generalizability
7. Theoretical relevance
8. Level of analysis

He suggests a move away from the "value-laden" prescriptive criteria often used currently toward more flexible goal sets, tailored to the individual operation. A clear understanding of the particular organization's goals and functional and environmental uniqueness is necessary before beginning to evaluate effectiveness.

Improvement

According to Drucker (1974), in order to be effective, a service organization should:

1. Define what their business is and what it should be.

2. Derive clear objectives and goals from their definition of function and mission.

3. Think through priorities of concentration which enable them to select targets, set standards of accomplishment and performance, define minimum acceptable results, set deadlines, go to work on results, and make someone accountable for results.

4. Define measurements for performance

5. Use these measurements to feedback on their efforts; that is, to build self-control from results into their system.

6. Audit objectives and results to identify those objectives which no longer serve a purpose or have proven unattainable.

Drucker also feels that effectiveness, or emphasis on the right results, is needed above all else.

Georgeopoulos (1972), in writing about hospitals, states that effectiveness function is determined by:

Organizational Adaptation - The ability of the organization to adapt to the external environment and carry on an effective interchange with it at all times.

Organizational Allocation - The ability of the organization to deploy, allocate, and utilize available resources, facilities, funds, and personnel in the most appropriate manner.

Organizational Coordination - The ability to articulate, interrelate, and regulate--to constantly coordinate, in time and space--the many diverse but related roles and interdependent activities of its many different staffs and members, and to regulate and synchronize different functions.

Organizational Integration - Integrating individual members into the organization and integrating all parts of the social system with one another so that the total organization can achieve a certain overall social-psychological unity and coherence.

Organizational Strain - The ability to resolve or minimize and manage the tensions and conflicts which arise within the organization.

Organizational Output - The ability to reach and maintain high levels (in terms of quantity, quality, acceptability, and costs) of output, e.g., patient care or health service to the community, at all times.

Organizational Maintenance - The ability of the organization to preserve its identity and integrity as a distinct and unified problem-solving system.

In complex organizations, efforts to improve effectiveness may be hindered by rising costs or ineffectiveness in other departments. Drucker (1974) stresses the importance of managers understanding that 10 to 15% of the phenomena (products, orders, customers, markets, or people) produce 30 to 90% of the results (Pareto principle). Managers must, therefore, concentrate their efforts on those worthwhile activities which are capable of being effective.

Effectiveness, according to Yuchtman and Seashore (1967), goes far beyond survival. But Katz and Kahn (1971) state that at times,

short-term criteria for effectiveness including profits, are sacrificed for survival which is the ultimate long-term goal of any organization. A move away from assessment and control for any length of time, however, could ensure its extinction.

Quality of Worklife

Quality of worklife represents the tendency of an individual worker to act in a certain way when confronted with a given set of stimuli from his work environment (Terry and Dar-El, 1980) and is the affective responses of participants in a system to socio-technical aspects of the system (Sink, 1982). In order to understand quality of worklife and its implications for improved performance, one should first understand a little about this "individual or participant" to whom the referred above definition refers.

In a recent Restaurants and Institutions Survey (1981), management described today's worker as more demanding, less dependable, lazier, and less skilled than his predecessors. The number of employees saying that hard work paid off has dropped in recent years and there has been an increase in the number of employees who distrust their employers. Americans are no longer willing to tolerate boring jobs and they feel that they have the right to refuse to transfer with the company if that transfer is unsatisfactory to them. Management laments the disappearance of the work ethic. Those hardworking people who quietly did their jobs and in return were given economic security, an increasing standard of living, and respectability, no longer exist. But then, neither do economic security and increasing standards of living. And respectability is no longer as strong a motivator as it

once was. Miller (1980) states that goal incongruency exists between employees over 35 and those under 35 years of age. The former are motivated by the chance for upward mobility and material possessions, while the latter group seeks more leisure time, meaningful work (defined as that which gives them a feeling of self-esteem), and duty to self. While those over 35 are making long-term plans, workers under 35 are living day-to-day. Miller also cites a recent Gallup Poll of males in which high levels of worker dissatisfaction was seen not only in young workers but in a large number of workers from 21-65 years of age. These workers state that their needs are not being met by work. But what are their needs, and why, with all of our incentive plans and fringe benefits, are we not meeting them?

Drucker (1954) stresses the importance of workers having some control over their work. They should be able to control the speed and rhythm of that work. Glaser (1976) feels that the essential component of any QWL program is the real and ever present opportunity for individuals or task groups at any level to influence their working environments, to have some say over what goes on in connection with their work. Satisfaction with one's work is also a function of the number and amount of rewards one receives as well as what he considers to be a fair level of reward (Lawler and Porter, 1967). Authors such as Herzberg et al. (1959) differentiate between hygiene factors (those necessary for job satisfaction but which do not motivate) and motivating factors which increase performance. These authors list as hygiene factors: pay; job security; working conditions; status; company policies; quality of technical supervision; quality of interpersonal relations among peers, supervisors, and subordinates; and fringe

benefits. Their motivating factors are: achievement, recognition, challenging work, responsibility, advancement, and personal growth, learning, and development. These distinct variables were linked by Hopkins et al. (1979), who, in a study of hospital and school food-service personnel, found satisfaction with one's work and supervisor to be closely linked to performance. Also, workers who were satisfied with their salary and promotional opportunities were found to be slightly better performers. Miller (1980) stresses the importance of keeping workers informed--they want to be involved, want more responsibility and knowledge of the operation.

Despite the innumerable number of studies which have been done on satisfying and motivating factors, the widespread occupational discontent and slumping performance in this country seem to suggest that management is not meeting the needs of its workers. Glaser (1976) suggests that management fear plays a key role in why the quality of worklife is not adequate. Management sometimes feels that by allowing workers more say they will lose control, responsibility, and authority. Management's fear sometimes manifests itself in poor performance. Miller (1980) describes a study by a consulting firm in which 25% of time lost on the job was found to be due (at least in part) to management's failure to explain its expectations. Unions, too, fear that if management is receptive to the needs of its workers they could lose status or even cease to be needed.

Why Measure QWL

The concept of quality of worklife has been around for a relatively short time. While Frederick Taylor was working at Midvale

Steel in the late 1800's, he espoused the idea of improved performance through the simplification of tasks (Taylor, 1911). His ideas on scientific management were widely accepted in his day. Today, however, we know that tedious work breeds discontent. Herzberg (as cited in Pascarella, 1980, p. 50) states that "you can't manage people scientifically" and that "the worst thing you can do is have technology that is not based in humanism."

According to Likert (1967), the performance and output of an enterprise is entirely dependent upon the quality of the human organization and its ability to function as a tightly knit, motivated, technically competent entity. In a 1973 Gallup Poll, 50% of all wage earners said that they could accomplish more each day, and 60% of those stated they could increase their performance by 20% (Miller, 1980). If this is the case, then management is not adequately tapping its labor resource--behavior is not being linked with performance.

The purpose of quality of worklife assessment is to provide means for identifying behavioral problems which are inhibiting performance (Terry and Dar-El, 1980). The same authors state that productivity is highest in organizations in which groups are encouraged to utilize creative potential to seek out problems and assist in solutions. Therefore, in these days of rising labor costs, declining productivity figures, increased unionization, and high absenteeism and turnover, it is crucial to understand the worker; his needs, goals, and motivators.

How to Measure QWL

Terry and Dar-El (1980) suggest beginning any quality of worklife evaluation program by clearly defining the purpose for the measurement.

Does the organization want to inform employees of their perceptions of the QWL or does it want to motivate management to solve existing problems? Chances are it will seek to do both. Marks (1982) differentiates between proactive and reactive quality of worklife measurement. Reactive measurement is done after-the-fact, in response to a particular problem. Proactive measurement is done before problems exist (or become evident) in the hope of avoiding discontent. Assessment can be done by personal interview, by questionnaire (completed at work or mailed to the employee at home), or by tracking surrogate measures such as tardiness, absenteeism, and turnover. The measurement means may differ from organization to organizaton depending upon economic situation and degree of decentralization. Interviewing is very costly and time consuming. Questionnaires completed at work are time consuming; those mailed out generally have a very poor rate of return. Following absenteeism and turnover may signal a problem, but more specific information is needed before improvement efforts can be undertaken.

Questionnaire

Marks (1982) gives the following suggestions for questionnaire usage:

1. Promise confidentiality and give it. If an identification code is to be used, tell the employees it is there and why. It is generally recommended that this be done so that trends related to demographic data can be followed.

2. Participation should be voluntary and the respondent should be free to omit any question which he feels may violate his anonymity.

3. Restrict the range of responses for easier analysis.

4. Restrict the length of the questionnaire so that boredom does not become a factor. Supervisors are also more willing to cooperate the shorter the amount of time the employee will be away from his work station. Marks states: ". . . if the investment of allowing time during the workday for completion of the questionnaire is too substantial for your management, then they probably would be unlikely to invest time in hearing and using the results anyway" (p. 687).

5. If funds are limited, survey a sample. This sample should be representative of the organization with departments represented proportional to size. Samples have the disadvantage of sometimes causing resentment on the part of employees not included. These employees may later question the validity of the survey results.

6. There should always be enough employees present to provide a feeling of anonymity.

7. The questionnaire should be administered by someone who can answer all employees' questions.

8. Always provide feedback. The collection of data implies a psychological contact and the employee is entitled to know the results. Also, taking part in a survey is motivating--lack of feedback will be a demotivating factor which could make subsequent surveys more difficult.

9. Credibility and trust are vital. If the organizational climate is not one of trust, an outside consultant should be used.

Woolf (1970) suggests notifying union leaders before beginning any quality of worklife evaluation program.

There are two types of instruments which may be used for quality of worklife assessment. The first is the internally generated, which is applicable to the specific organization and the other is the "generic" or externally developed instrument.

Organization-Specific Questionnaires. The information sought in questionnaire administration includes the following:

1. mean scores of all employees for all sections of the schedule
2. analysis of different mean scores of the various categories measured
3. analysis of difference in mean scores of part-time and full-time employees
4. comparison of mean scores of different employee groups, department, levels of authority, and shifts
5. measure of variance of times, sections, and the entire instrument to determine dispersion or range of feelings (Woolf, 1970, p. 84).

The person selected to develop the questionnaire should be competent to compute statistical results and analyze any trends, and interpret them for other managers. He/she should also be able to provide accurate feedback.

Terry and Dar-El (1980) suggest beginning with an unstructured personal interview of a representative sample of employees. Answers should be followed up with probing questions. The information obtained in the interview can then be used to develop a closed-form questionnaire. Sinclair (1975) stresses the importance of evaluating questions on the bases of objectivity, quality of measurement, validity, reliability, and resource availability. The same author states that care should be taken to ensure that: (1) the respondent

is motivated to respond; (2) the respondent has the particular knowledge required; (3) the questionnaire takes into account the respondent's limitations and personal frame of reference, so that he will understand the aim and meaning of questions; and (4) the respondent has produced an adequate answer from his own knowledge. Any questionnaire should be pilot tested with colleagues, with a few employees and then with a larger sample. Terry and Dar-El suggest that improvement may be needed if:

1. respondents want to change or add to items,

2. many items are skipped or the uncertain response is used frequently,

3. respondents are not interested in discussing the questionnaire.

The same authors suggest use of a multiple regression model for analysis. Productivity should be the dependent variable and quality of worklife scores of the independent variable. The regression coefficient for each QWL dimension should be tested for significance. Those dimensions with significant regresson coefficients are the ones which influence productivity. Data from the survey may be distributed in what Marks (1982) calls the "waterfall method" (top management down), or the "flood method" (all employees simultaneously). He suggests that criteria for data selection for presentation include its relevance to issues of importance to the audience, its comprehensibility, and its relationship to the worklife area over which the receiving groups have influence.

Generic Instruments. There are several widely used generic instruments for the measurement of the quality of worklife and its related parameters. The Job Diagnostic Survey (Hackman and Oldham, 1975) was developed to evaluate current jobs to determine how they might be redesigned to increase output and motivation and to evaluate the effects of these changes on employees. The questionnaire examines five core dimensions: skill variety, task identity, task significance, autonomy, and feedback. Measures of three critical psychological states are also provided. These are the experienced meaningfulness of work, experienced responsibility for work outcomes, and knowledge of results of work activities. Employees' affective reactions to the job are also measured. The Job Diagnostic Survey (JDS) should always allow for employee anonymity and should not be used to diagnose the job of a single individual. The Job Description Index (JDI) was developed by Smith et al. (1969) and measures five variables: opportunity for promotion, pay, relationship with co-workers, supervision, and the work itself. Woolf (1970) states that the JDI is unique in that it provides only three possible answers to each question. This simplifies analysis considerably--yet accuracy is not sacrificed. The JDI can also be self-administered because it is written in simple vocabulary. Hopkins et al. (1979) state that the JDI is stable over time and applicable to employees with different demographic characteristics. These authors used the t-test to compare mean JDI scores of hospital and school foodservice employees. Ruf (1975), in her study of hospital foodservice workers, found the average score for females to be 162 and for males, 172 (out of 216 possible).

The Brayfield and Rothe (1951) Job Satisfaction Index is another commonly utilized instrument. It consists of 18 questions. A five-point Likert-type scale is used, ranging from strongly agree to strongly disagree.

The Job Characteristics Inventory was developed by Sims, Szilagyi, and Keller (1976). This instrument consists of 30 items which fall into the following categories: variety, autonomy, feedback, task identity, dealing with others, and friendship. The reliability, construct, convergent, and discriminant validities of this instrument have been tested by the authors. (See Table I for a summary of job satisfaction and organizational climate questionnaires.)

Surrogate Measures. As stated previously, many organizations measure QWL by following absenteeism, tardiness, and turnover. Lack of availability of new personnel might also signal problems in QWL. Although these factors can alert management to problems with the quality of worklife, they do not always indicate such. In her article, "The Motivation of the Underprivileged Worker" Davis (1969) discusses cultural and socioeconomic differences which contribute to absenteeism and turnover. This type of worker often has short-term goals. In order to improve his/her performance, management must help him/her learn to want higher social goals for him/her and family. Also, their health may be poor due to adverse living conditions. High absenteeism and turnover are learned traits--and are very common among this type of worker.

TABLE I

QUALITY OF WORKLIFE INSTRUMENTS

Job Satisfaction Questionnaires	Description
Job Diagnostic Survey (JDS) (Hackman and Oldham)	Measures five core job dimensions--skill variety, task identity, task significance, autonomy, and feedback. Also measures three critical psychological states (experienced meaningfulness of work, experienced responsibility for work outcomes, and knowledge of actual results) as well as affective reactions to the job (general satisfaction, internal work motivation, and specific satisfactions). A seven-point response scale is used.
Job Descriptive Index (JDI) (Smith, Kendall, and Hulin)	Measures opportunity for promotion, pay, relationship with coworkers, supervision, and the work itself. Participants are asked to respond with a "yes," "no," or "cannot decide." An 18-item supplement entitled the "Job-in-General Index" is also available to be used in conjunction with the JDI.
Job Characteristic Inventory (JCI) (Sims, Szilagyi, and Keller)	Measures variety, autonomy, feedback, task identity, dealing with others and friendship. A five-point Likert scale is used.
Brayfield Rothe Job Satisfaction Index (Brayfield and Rothe)	Measures overall attitude toward job. Does not consider specific items such as pay or working conditions. Respondents select from a five-point Likert scale.
Organizational Climate Questionnaires	
Likert, Litwin and Stringer, Campbell and Pritchard, Halpin and Croft, Hall and Lawler	Generally measure (in varying forms) autonomy, structure, reward, consideration, warmth, and support. Some also consider other dimensions such as interpersonal relationships, communication, motivational climate, tasks, and technology.

Quality

Pascarella (1980) states that the core of our institutions has to be quality--quality of people and product could form the basis for what he calls "more mature illusions" for our country (p. 49). Instead of serving the system, people must serve the customer. At present, 15-40% of the manufacturers' costs of American products is for waste--waste of human effort and waste of machine time (Demings, 1981-82). Quality is the degree to which a product or service conforms to a set of predetermined standards related to the characteristics that determine its value in the marketplace and its performance of the function for which it was designed (Adam et al., 1981). Juran and Gryna (1980) define it simply as fitness for use. According to Szilagyi (1981) quality is comprised of the following dimensions:

Function - performing the purpose for which it was intended.

Reliability and Durability - length of time the product will perform its function.

Aesthetic Characteristics - physical appearance of the product.

Safety - whether the product performs its function without unnecessarily endangering the user.

In hospitals, quality is dictated to a certain extent by the Joint Commission on Accreditation of Hospitals, as well as by federal, state, and local regulations. Other private organizations such as the Commission for Administrative Services in Hospitals (CASH) in Los Angeles have developed their own quality control systems. The CASH system also includes a partial factor productivity index (meals divided by direct labor hours), which it refers to as the "utilization

index." Some of the objectives of the CASH plan are: to provide quality indexes which are part of the ongoing management control process, to provide feedback to allow for correction of problems, and to provide quality assurance upon implementation of systems and workload revisions (Edgecumbe, 1966). The quality of food preparation, service, housekeeping, and sanitation are measured by the CASH system. The Food Service Manual for Health Care Institutions (Mahaffey, et al., 1981) suggests that quality be controlled in foodservice based upon sensory, nutritional, and microbiological criteria. Sensory criteria include flavor, taste, aroma, texture, sight, and temperature. Nutritionally, it is important that food not be overcooked to conserve nutrients, and microbiological factors such as equipment sanitation, employee hygiene, and work habits must be considered. (For an extensive list of evaluation criteria, see Mahaffey et al., 1981, pages 272 and 273.) The same authors suggest planned menus, detailed specifications for all items received, and storage conditions, accurate forecasting, standardized recipes, ingredient control, proper equipment maintenance, and production scheduling (to avoid excessive holding of cooked foods) as contributors to a high quality product.

The American Dietetic Association (ADA Journal, 1974, p. 665) defines quality food as that "which has been selected, prepared, and served in such a manner as to retain or enhance natural flavor and identity; to conserve nutrients; and to be acceptable, attractive, and microbiologically and chemically safe."

Many factors affect quality in foodservice. In a study conducted by Ruf and David (1975), negative correlations were seen between

highly structured supervision, tenure of three to nine years, mode wage rate, the increased use of ready to serve foods, and the quality of meals. Positive correlation existed between routinization (presumably because of the use of standardized recipes, cafeteria style menus, shortened patient menu cycles, and written specifications for food purchased) and the amount of delegation (more sharing of responsibility with employees) and the perceived promotional opportunities.

Measurement

Further research is needed which focuses on the design of experimental studies to evaluate the effectiveness of quality assurance activities, conditions under which these activities have an impact, and the most effective strategies for their implementation in various organizational types (Kaluzny, 1982; Hetherington, 1982). Ruf and David (1975) stated that quality standards are needed which are specific to the individual hospital foodservice operation.

An increase in the ratio of quality of services provided to the resources used in providing them implies that productivity has been improved only if the service has either increased or remained the same. Thus, it is vital that quality be assessed periodically as part of any managerial control system. Crosby (1979) states that quality management is a systematic way of guaranteeing that activities happen the way they are planned. Many authors have suggested that quality is inherent in productivity measurement, while others such as Siegel (1980) suggest correcting for changes in quality over time through the use of a conversion factor or by separately weighting inputs and outputs according to quality. Adam, et al. (1981) stress the importance

of counting only acceptable end products as output in productivity measurement. In hospital foodservice, for example, the inclusion of incorrect trays or unacceptable returned food which involves rework later in output figures without including the rework time in labor (input) figures will result in an inflated productivity index or ratio.

Although quality is subjectively appraised by a supervisor, dietitian, or chef in foodservice, Ferdeber (1982) suggests quantifying this quality data, thereby making it more objective. First, a questionnaire is developed based on federal, state, JCAH, and the quality coordinator's standards. The questionnaire should cover procedures, service, records, equipment maintenance, bacteriological measurement, public relations, and the physical environment. Random inspections are made over a three month period, then a quality index is developed for each category. This index is based upon the relationship between the total number of positive (satisfactory) answers and the total number of answers. A total quality index for the operation is then generated from the index for all categories.

Quality assessment in foodservice (as in most American industries) is generally of the feedback type (evaluation of the final product). Szilagyi (1981) differentiates between feedback and feedforward quality control. Feedforward control focuses on the quality of incoming raw materials and evaluation of the work in process. This type of control can eliminate the need for rework (and scrap) and thus improve productivity. Hershauer (1979) emphasizes this point as well by stating that measurement is generally on the performance of the

final product with little emphasis on measurement of either causal factors or resources consumed by the quality effort.

Improvement

In his study of Hewlett Packard, Hershauer (1979) found that employees feel that the personal ability to make decisions regarding quality is the key to a high quality output. Sink (1982) states that in the 1980's, it is becoming increasingly clear that without some form of effective and efficient employee involvement, productivity and quality improvement efforts are unlikely to be as effective as they should or could be. The same author stresses the importance of feedback as a motivational tool to improve quality. Employee involvement cannot assure a quality product, but it has been shown that the lack of it can have a negative effect on quality.

Kaluzny (1982) suggests re-education, persuasion, facilitation, and coercion as strategies which contribute to a quality assurance program's success. The appropriateness of each for a particular situation should be evaluated before efforts are begun. The importance of a holistic view of the organization and the product is also stressed by Hershauer (1979). At Hewlett Packard, one-third of the fabrication employees viewed final customer quality of their product as unknown. Without an understanding of the customer for whom the product is prepared and the product or service itself, there is little feeling of responsibility for the quality of that product or service. This is particularly a problem for foodservice operations in which support employees may never see the final product as it is received by the patient or customer. A hospital dietary department is far removed

from patients several floors up, whose preferences, medical problems, etc., are never known to the dietary employee.

Quality assurance programs can promote organizational effectiveness by increasing bureaucratic responsibility, containment of costs, attraction of valued resources, and preservation of values (Hetherington, 1982). As such, it is clear that quality assessment must be an integral part of the control process.

Efficiency

Harrington Emerson's book, The Twelve Principles of Efficiency, was published in 1912. He states that for the organization to be as efficient as possible, it must have ideals, common sense and judgment, competent counsel, discipline, the fair deal, reliability, immediate and accurate records, planning and dispatching, standards and schedules, standardized conditions, standard operations, written standard practice instructions, and efficiency rewards.

Today, efficiency is as important to organizations as it was when Emerson's (1912) book was published; perhaps more so. Smalley and Freeman (1966) define efficiency as the relation between achievement of objectives and the consumption of resources. Katz and Kahn (1980) state that efficiency refers to the use of inputs to obtain a maximum return, and Drucker (1974, p. 45) states that efficiency is "doing things right."

According to Johnson (1981), efficiency has been defined in management literature as:

1. progress toward organizational objectives at the least possible cost

2. personal efficiency in individual performance
3. work output above normal expectations
4. doing work right
5. satisfaction of individual motives when operating jointly toward a common goal
6. productivity
7. reduction in unit cost of output (p. 13).

Efficiency is defined for the purposes of this research as the degree to which the system utilized the "right" amount of resources, or:

$$\frac{\text{Resources expected to be consumed}}{\text{Resources actually consumed}}$$ (Sink, 1983a)

Efficiency and effectiveness are closely aligned. Many authors see efficiency as a criteria of effectiveness--one of the organization's goals. Drucker (1974) states that efficiency is a minimum condition for survival after success has been achieved. An organization may be very efficient but if it is ineffective (not doing the right things), it may fail.

Productivity

Bernolak, in his article, "New Productivity Thrust From Effective Measurement" (1981), states that the three weaknesses which have been observed in industries in regard to productivity are:

1. A lack of understanding or awareness of it
2. Unfamiliarity with methods of measuring it

3. Lack of corresponding performance data of other firms in their sector with whom they could compare their own preference.

This author would also add to that a fourth weakness--the inability to incorproate measurement data into improvement efforts. This section will cover each of these weaknesses in an attempt to clarify what productivity is, how it is measured, and how it can be improved at the firm level.

Definition

Productivity as used in the vernacular means everything from production to personal time management. Sink (1983b) states that in his work with over 500 managers, the repeatedly occurring fact is that managers believe productivity equals performance. If employees produced three meals per labor hour yesterday and five today, they are "more productive," according to these managers. (Productivity. however, is a component of performance.) Productivity involves a relationship between outputs and inputs. As previously stated (see "Definitions," Chapter II), the definitions accepted for this study include: (1) the ratio of quantities of outputs to quantities of inputs (APC, 1979), or (2) reaching the highest level of performance with the least expenditure of resources (Mali, 1978). Others which are in keeping with this idea include Welch's (1975)--the efficiency of a given input at producing a specified output--and Balk's (1975)--the optimization of efficiency and effectiveness. Stewart (1978) defines productivity as the degree to which organizational performance contributes to goal attainment.

A wealth of information has been written in the last two decades about productivity. In reviewing the literature, one begins to wonder why so many experts have concentrated in recent years on this performance criteria. According to Stein (1971), there is a syndrome of inflation in which prices and wage rates rise, and each, at different points in time, tries to catch up with the other. The only way to effectively break this inflation syndrome is to increase the rate at which productivity grows so that wages can rise without increases in unit costs. The pressure on prices is then abated. Stein also feels that an increase in productivity can increase the ability of people to do what they want to do. It can provide a higher standard of living, more leisure time (holidays, vacations, and earlier retirement), and resources for improving the physical quality of the environment. Grossman (1980) adds to this the ability to provide higher wages. Otis (1975) states that productivity is our biggest undeveloped resource and that productivity growth increases economic growth, social progress, and political freedom.

In recent years, productivity growth in this country has slowed. According to Grossman (1980), total factor productivity (see "Definitions," Chapter II) of the private domestic business economy declined by 0.90% between 1978 and 1979. Between 1973 and 1978, TFP growth rate had dropped to 0.2%, compared with growth rates of 3.0% from 1948-1965, and 2.1% from 1965-1973. At this rate, other countries will catch up with us in gross domestic product per employee (that which is produced in the Continental United States) as follows: Germany, 1984; France, 1985; Japan, 1992. Stein (1971) states that the reduction in the gap between our productivity and theirs is not of

concern to us, that it is to our advantage for their productivity to be high. The rise in their productivity levels has been accomplished by embracing modern technology and by increases in hourly compensation in the previous five years which exceeded those in the United States. The relationship between output per labor hour and compensation was closer in these countries than it has been in the United States, so their unit labor costs did not rise as much in those years.

Reasons given for our poor productivity performance differ depending upon whether one is talking with management, government, or organized labor. Otis (1975), an industrial engineer, lists the following factors as those which influence productivity:

Factor	Example
Technological	Ingenuity of engineers [Robotics]
Management	Attitude and behavior of businessmen
Financial	Availability of capital for financing innovations
Labor	Characteristics of the labor force
Government	Policies, taxation
Economic	General economic climate
Natural	Uncontrollable items, "Acts of God"

Grayson, of the American Productivity Center ("Why U.S. Workers are Producing Less," 1978) states that America's productivity problem has been blamed on such factors as rising energy costs, inadequate capital investment in more productivity facilities and technologies, increased government regulation, increased growth of service industries, decrease in manufacturing jobs, expansion of the labor force with inexperienced workers, and inflationary collective bargaining

agreements. Smith (1977) expressed labor's viewpoint when he states that (1) American industry, in the trade-off between investing in capital and investing in labor, has always chosen capital; (2) increases in productivity did not keep pace with increases in wage levels; and (3) in declining output periods workers are not laid off in direct correlation to declining levels of output (quality control, foremen, maintenance, and professional personnel are not laid off proportionately to production workers). Smith suggests that unions and their members can help improve productivity by using facilities and time more efficiently, by reducing delay time due to breakdown of machines and equipment, correcting problems such as lack of available raw materials, conducting proper maintenance of equipment, and paying strict attention to quality control.

Management often cites government bureaucracy as a major cause of productivity decline, while government cites management ineptness (poor control). (No matter what the cause, one thing is certain. Management, government, and labor are all concerned about productivity levels in this country and are seeking ways to improve them.)

Measurement

The average hospital can achieve 11 to 29% greater productivity in its dietary services (Groner, 1964). Borsenik ("Productivity is its Own Reward Contest," 1973) states that by utilizing the knowledge and ideas currently available, foodservice productivity could be increased 30%. The utilization of information to effect positive change in productivity begins with precise, accurate measurement.

Day (1981) suggests that there are three steps involved in productivity measurement. Step one is the development of work standards. (For a review of work measurement as a means of setting standards, see Robertson, 1982.) Step two is selection of a partial productivity measure for the particular organization. A partial productivity measure is the ratio of gross or net output to one particular input. This type of measurement comes closest to representing the total productivity status of an operation when that operation is highly labor intensive, as is foodservice. (The most commonly used partial factor measure is the ratio of a particular output to the labor hours used in producing that output.) In foodservice, the unit most often used is meals per labor minute or hour. Klein's (1978) research found that many administrative dietitians preferred labor minutes or hours per patient day, as this information is easily obtained from the patient census. For cafeterias, labor hours utilized to serve 100 customers was the measure proposed by Freshwater (1967). Welch (1975), however, used meals served per labor hour for residence hall cafeterias. Sumanth (1981) and Sumanth and Einspruch (1980) report that partial productivity measurement is the most commonly used measure in industrial companies at the corporate, plant/divisin, department, and product levels. In non-industrial companies, total factor was found to be more commonly used than partial at the corporate level. Siegel (1980) suggests beginning with a partial measure, even if a total productivity measure is eventually desired. Capital is extremely difficult to quantify and is therefore best left to those with extensive experience in productivity evaluation. There are also multifactor measures which include materials, energy, and labor, but

omit capital. Step three in productivity measurement, according to Day, is the use of total measures, which include such inputs as materials, energy, labor, and capital.

Measures may be indexes or ratios. An index is a ratio which can be divided by itself (the same unit is expressed in the same terms for two different periods of time). A ratio involves two different but related units of measurement. For example, meals produced per labor minutes (output/input). Ratios and indexes may also be dynamic. Siegel (1980) defines an index as the ratio of output or input aggregates that refer to different periods but incorporate the same set of weights. This is a dynamic index. An example is:

$$\frac{\frac{\text{Output for current period}}{\text{Output for base period}}}{\frac{\text{Input for current period}}{\text{Input for base period}}}$$

Any comparison of different periods should involve price weighting in constant dollars so that inflation does not artificially elevate the resultant productivity figure. In foodservice, management often evaluates productivity on the basis of sales per employee ("What is NRA's Role in Productivity?", 1973; "Productivity: What Steps Will You Take to Increase Employee Productivity?", 1980). Before these figures can be compared with those of previous years, the value of sales must be adjusted to equal the value of sales in the previous period. An annual raise in prices yielding more dollar sales per labor unit does not necessarily mean that productivity has increased. Firms which price recover can survive only as long as competition permits (Adam, et al., 1981); therefore, foodservice must not rely on

price increases to cover input costs--productivity must be improved so that prices may be kept constant, yet the operation must still be profitable.

The generation of appropriate measures to use can be a difficult process which differs depending upon the nature of the business, the product and service, the inflation, and the efforts of supporting departments (Sutton, 1980). A consultative (or absolute) approach may be used in which experts are called in to develop measures, indexes, and ratios and perhaps to design an improvement program. The participative (or normative) approach may also be found to be useful. The participative approach assumes that workers know better than anyone else how they can be more productive. The Nominal Group Technique (Delbecq et al., 1975) has been found to be very effective for generating productivity measures (Ohio State Productivity Research Group, 1977). For a complete discussion of Nominal Group and Delphi Techniques, see Sink, 1978). Thor (as cited in Day, 1981), of the American Productivity Center (APC) states that the result of the normative model is small measures with which people are comfortable and because they have developed them, they are more likely to work toward them.

Despite the fact that productivity measurement has improved substantially in the last 20 years (Stein, 1971), there are still many areas in which additional work is needed. Heaton (1977) tells the story of a Russian nail factory in which the quota was based upon tons of nails produced. The factory produced only railroad spikes. When the measurement unit was changed to the number of nails produced, the factory produced only tacks and brads. The story effectively expresses the importance of measuring the right things in the right manner.

McDermott (1982) lists five points which any organization should consider before developing a measurement system:

1. What if outputs cannot be measured (as in many service organizations)?

2. What if interactive effects of input costs and staff reductions are not measured?

3. What if outputs are returned due to poor quality?

4. What if the measurement system developed measures the efficiency of people or machines which do not contribute directly to the main output?

5. What if one or more productivity measures which accurately measure appropriate outputs and associated input costs cannot be developed (p. 69)?

Mundel (1976) lists the following as potential errors in measurement:

1. Overly simplistic measures of output - an example of this in hospital foodservice might be the omission of snacks, nourishments, special diets or tube feedings which are prepared in addition to regular meals from output figures.

2. Suboptimization - an example in foodservice is the application of work measurement techniques to dishwashing personnel which results in a reduction in workforce. The result may be disaster during peak periods in which shortages of clean dishes would decrease productivity for waiters, cooks, and others.

3. Counting outputs which are not final outputs - any rework on a patient's tray must be figured into the meal count.

4. Counting outputs in a manner not related to goals - to measure productivity of quality control personnel in terms of number of defects found would be inconsistent with the goal of producing quality food.

5. Counting outputs in a manner not related to inputs --such as considering patient satisfaction as an output (p. 25).

Mundel also states that numbers 3, 4, and 5 are most common in service

organizations where outputs are often unquantifiable. Foodservice is a service function, although for the purpose of productivity measurement, it is actually more like a manufacturing concern than a nursing staff, for example. A concrete end product which can be counted is produced. Foodservice does involve many service aspects, however, such as galley personnel in a hospital. Unlike manufacturing, foodservice employees have direct contact with the consumer of their product; therefore, some service functions will be necessary. Balk (1975) states that measurement is easiest when workers perform routine tasks which vary little from day to day. If, however, one is trying to measure the productivity of personnel in positions in which there is great task ambiguity, the following must be considered:

1. Measurement, reliability and validity decrease
2. The utility of efficiency ratios decreases
3. The importance of effectiveness ratios increases
4. The possibility of a single measure to define a productivity situation decreases (Balk, 1975, p. 131).

It will be, therefore, much easier to measure the productivity of production personnel than that of service or professional personnel. Balk (1975) suggests that employee involvement becomes even more important in this situation, that group productivity should always be measured in lieu of individual performance and that managers must take higher risks in predicting outcomes.

The importance of accurate measurement can be seen in feedback received by Bernolak (1981), in his study of productivity in Canadian industries. Such statements as "It was a terrible shock to discover that although output per manhour (in the company) had increased 20%

during that period, the increase in the industry for the same period was about 60%" and, "thought we were much better off and we have a lot of improvements to achieve" show that subjective evaluation of productivity is not always accurate (Bernolak, 1981, p. 769).

Implementation and Improvement

Siegel (1980) warns that any improvement program which is adopted should not be too ambitious in scope, scale, or time schedule. Lack of goal attainment is a demotivator which could spell doom to an overly ambitious measurement or improvement program. He goes on to say that companies should adopt or more diligently pursue programs of productivity improvement with such objectives as strengthening competiveness in domestic or foreign markets, acquiring greater flexibility in response to external conditions, cost-control and conservation, acquisition of funds for capital investment, and payment of fair wages.

Buehler and Shetty (1981) state that it is the efficiency and innovativeness with which organizations combine capital, advanced technology, human resources, and creative management that determines the rate of productivity improvement in an enterprise. They list as key elements of a productivity program:

1. Top management support with someone responsible to top management for the program.
2. Worker involvement at all levels.
3. Improvement linked with measurement.
4. Having adequate information resources available.

5. Developing plans, goals, and objectives for improving productivity by reducing waste and accidents.

6. Effective up and down communication.

7. Periodic review, evaluation, and analysis of the program.

Many suggestions have been made for improving productivity in foodservice. Schmeid ("Stepping Up Restaurant Productivity," 1973) stresses the importance of (among others) setting realistic work standards and goals, matching people with job requirements, paying an adequate wage with periodic reviews, telling each person where he stands, improving the work environment, and making workers aware of how they are contributing to solving department and company problems. Carnes and Brand (1977) state that the spread of modern management techniques and work organization, simplified and standardized menus, improved layouts, increased use of convenience foods, and technological innovations such as the microwave have all contributed to increased labor productivity in eating and drinking places.

Magill, of the National Restaurant Association (NRA) ("What is NRA's Role in Productivity?" 1973) stated that the first step toward improving foodservice (restaurant) productivity is for operators to learn how to measure it. He also believes that adequate training and opportunity for advancement are important, as does Schmeid. Sky Chefs ("Productivity Measurement Still a Cottage Industry," 1981) uses a measurement system in which its meals are weighted according to complexity and then aggregated. This figure can then be divided by the EE's (equivalent employees) to obtain a partial (labor) productivity value. Sky Chefs strongly espouses the use of the participative mode as well to supplement the above data. Improvement is left to the

individual unit because it is felt that they best know where inefficiencies lie.

Groner (1964) describes how industry comparison can help hospitals (and their foodservice departments). The Hospital Administrative Service (HAS) publishes a partial factor (labor) productivity value for dietary supplements for all participating hospitals in Hospitals magazine. CASH (see quality section) also publishes industry productivity data, as does the Commission on Professional and Hospital Activities through its Professional Activities Service (PAS). The Bureau of Labor Statistics plans to publish information related to hospitals (Mark, 1982).

The productivity of service organizations can be calculated as a product of input, processing, output, or follow-up, timing and coordination; and the productivity of any organization can be no higher than the productivity of its weakest function (Heaton, 1977). Sumanth (1981) states that there is a definite need for educating the industrial companies of the United States in productivity measurement. This need also exists in foodservice. We must begin measuring, then we must apply that measurement data to improvement efforts. An analytical framework which encompasses all of the inputs and outputs of the system and which reveals how each of these contribute to performance is needed to give this data meaning (Gold, 1980). Sink (1982) states that the job of a manager is not only to decide which measures are appropriate and how to use them, but also to tie that measurement system in to improvement.

Additional study of productivity in foodservice is needed. Ruf (1975) states that more information on factors affecting productivity

components is needed, and Robertson (1982) stresses the need for continued education of foodservice management personnel in productivity measurement.

Profitability

Profitability is defined by Rausch (1982) as the earned return on owner's investment (equity) or the return earned on all things owned by the business (assets), and by Anthony and Herzlinger (1980) as the difference between revenue and expenses. Profit is an important part of the decision process in the profit-oriented company and the lack of this type of objective often causes confusion in the non-profit organization. It is often used as a measure of effectiveness by businesses (although it is incomplete). In the business operated for profit, profitability is the most easily quantified of the seven performance criteria.

Profit-Oriented Businesses

Profitability can be measured as the percentage of return on sales, the percentage of return on the owner's equity or the percentage of return on assets (Villano, 1977), or in absolute dollars or net income (Rausch, 1982). Financial reports such as the income statement balance sheet, and profit and loss statement play an important role in profitability evaluation. Rausch (1982) and Dudick (1972) stress the importance of ratio analyses as opposed to dollar amount in profit evaluation. Dudick states that ratios are diagnostic indicators of the wealth of a business and suggests such indicators as the

relationship of current assets to current debts, net profits on net sales, net profit on tangible net worth, and net sales to inventory.

In planning for profitability, two methods are commonly used in profit-oriented businesses. Return on investment relates earnings produced by a particular capital investment to the money needed to acquire it. Rausch (1982) states that it is by far the best available tool for deciding between several proposed capital investments. It is easily explained and defended and is also an excellent measure of management's performance. Break even analysis can be used to test a flexible budget, determine the volume of sales necessary to obtain a desired profit, compare profitability of various products or to determine what profitability would result from a range of sales values. Cost/benefit ratios are often utilized by non-profit organizations to determine the feasibility of various programs. They are the net present value of inflows minus the outflows divided by the initial investment (Anthony and Herzlinger, 1980). They are also helpful in profit-oriented operations in evaluating programs within nonprofit departments such as research and development, administration, and personnel.

Although often used as a measure of effectiveness, profit should not be the sole criteria for its evaluation. Profitability is short-term; monetary measures do not measure all aspects of output and input, and the standards against which profits are judged are not always accurate (Anthony and Herzlinger, 1980). Dudick (1972) states that any measure of return on investment should be compared with that of competition and trade association statistics. According to Axler (1979), profit offers an indicator of business performance only when

it is compared with expected profits, a standard or past performance. Anthony and Herzlinger (1980) stress the importance of comparing profitability against a standard or expected figure rather than against previous years. To say that a business has done well financially simply because profits rose from one year to the next gives no indication as to what profits could or should have been.

Dudick (1972) lists the following as keys to profit improvement:

1. Proper product pricing practices
2. Equipment utilization
3. Control of inventories
4. Knowledge of results
5. More realistic planning

Axler (1979) states that profit management in foodservice involves pricing, cost control, tax planning, and administration. Dukas (1976) lists the following as ways to increase profits in foodservice: reduce expenses, manipulate expenses (to reduce taxable income), or increase sales volume. The same author distinguishes between cost control (controlling costs) and cost accounting (simply recording costs). Cost accounting gives no information as to whether an expense was necessary; how and where it was incurred; or what person, activity or food group helped to create the expense.

Non-Profit Operations

A non-profit organization is characterized by:

1. The absence of a profit measure
2. Its tendency to be a service organization
3. Constraints on goals and strategies

4. Less dependence on clients for financial support
5. The dominance of professionals
6. Differences in governance
7. Differences in top management
8. Importance of political influences
9. A tradition of inadequate management controls (Anthony and Herzlinger, 1980, p. 34).

A hospital is considered non-profit if it meets the requirements described in Section 501 (c)(3) of the Internal Revenue Code of 1954. Although many hospitals are big business, the non-profit hospital differs from the profit-oriented in that its primary objective is service rather than profit. Both profit and non-profit operations must operate within a preplanned budget. Anthony and Herzlinger (1980) state that if revenue exceeds expenses, a hospital's prices are too high or it is not rendering enough service for what it charges. When receipts do exceed disbursements, the excess in a non-profit hospital is applied to expansion and replacement of existing facilities and equipment, amortization of indebtedness, improvement of patient care and medical training, education, and research (Berman and Weeks, 1982). Both voluntary (non-profit) and proprietary (profit) hospitals obtain their financial resources from sales revenues generated in a competitive or quasi-competitive market. Both obtain the bulk of revenues from third party payments, 30% from Blue Cross, 30% from governmental agencies, 30% from commercial and independent insurance companies, and 10% from patients (Berman and Weeks, 1982). The inducement to operate more efficiently is often absent as long as Blue Cross and governmental agencies accept the prices they are

charged. These agencies pay cost or cost-plus rates because they are considered wholesalers of healthcare; whereas, commercial and independent companies and patients pay a higher rate.

In the non-profit hospital, the "income" statement is commonly called the "activity" or "operating" statement, and the bottom line, rather than being labeled "income," is entitled "excess of revenue over expenses," or something similar to this (Anthony and Herzlinger, 1980). Terminology for such statements is given in the American Institute of Certified Public Accountants' (AICPA) Audit Guides for Hospitals. Many grantors require that hospitals utilize this organization's format and terminology in order to be considered for funding. The shareholder's equity on the balance sheet is instead called "equity" or sometimes "fund balance." Departments are called "responsibility centers" rather than "profit centers." All else, including all principles for the measurement of revenues and expenses, is the same in non-profit and profit organizations.

Profit is closely tied to productivity. Both are the relationship of inputs and outputs. Profitability is revenue (output) minus expenses (input), while productivity is outputs divided by inputs. Rausch (1982) states that greater productivity is the sole solution to the constant pressure for working capital. When capital becomes scarce, sales volume must increase or expenses must decrease. Good control of inventory and efficiency in operations are essential for profitability (Dudick, 1972).

Innovation

Szilagyi (1981) defines innovation as that which refers to the

efforts in the basic sciences to develop new technologies, processes, methods, and products. Mintzberg (1983) sees innovation as a way to break from established patterns. Innovation is not synonymous with creativity or imagination. The invention of the automatic transmission was a creative advance, but a change in a car's body design (to accommodate the new transmission) is innovation (Carney, 1981). All creative acts are innovative but not all innovations are creative. Innovation, then, is applied creativity, or as Mueller (1971) states, invention is conception of the idea and innovation is use of the idea. Innovation differs also from change in that innovation is a deliberate, novel, specific change aimed at accomplishing the goals of the system more effectively (Mueller, 1971). Change is not always beneficial or goal-directed.

Two types of innovation within organizations are delineated by Steele (1975). They are: (1) demand induced--challenging research and development (R and D) to discover the solution to a perceived need of the business (external impetus) and (2) supply pushed--persistent advocacy of an inventor who sees opportunity or latent need that he believes he can satisfy or he conceives a solution for which he seeks to demonstrate or create a need (internal impetus).

In the late 1950's, 82% of the world's major innovations were produced in the United States. By the mid 1960's, that percentage had dropped to 55%. In the mid 1960's, 50% of all research done in the world was done in the United States. Today, that figure is 20%. Our government, which once supported two-thirds of all research in this country, now supports one-half. The proportion of scientists and engineers in the United States dropped from 25.4 per 10,000 to 24.8

per 10,000 between 1965 and 1975, while during the same period it doubled in the Soviet Union and West Germany (Carney, 1981). Nineteen percent of all industrial R and D done in the United States is done by four companies and 75% is done by 100 companies (Steel, 1975). The following are given by Carney (1981) as reasons for the United States' decline in creativity and innovation:

1. Government regulations have made it so difficult that it is now impossible for businesses to finance the research necessary to develop products and still fulfill their obligations to stockholders.

2. Business leaders are not able to evaluate risk, so they take the easy way out and avoid anything they cannot prove to be safe.

3. The image of what a successful business is has changed and the requirements for success do not permit creative research.

4. The self-image of business leaders has changed; they must operate a business to fulfill their own ambition and there is no room for creative research or creativity of any kind.

5. Lack of appreciation in industry for any idea originating outside its own research prevents industry from taking advantage of a great source of creativity.

The same author suggests that money, when used correctly, could solve these problems and proposes that the government act as a venture capitalist, sponsoring the research of independent inventors. The government would receive a return of 800-1,000% in three to five years; therefore, the taxpayer would lose nothing. All taxes could be paid by whomever commercializes the product. He also proposes a liberalization of the policy on granting exclusive licenses on patents owned by the government, and feels that greater cooperation is needed

between universities where basic research is conducted and industry where that basic research can be operationalized to result in new products or processes.

According to Steele (1975), the creative process begins with the creator conceiving of something new; this then moves to the perception of a use or the use to which something new can be put by society. This new thing is then reduced to practice. At this stage it must fill a perceived need and must be reproducible by a reliable, economically feasible method. Potential users are then identified and induced to purchase. Of the total costs involved in this process, only 5-10% are utilized at the basic invention stage. Ninety percent of the costs are involved in the engineering and design of a product (10-20%), getting ready for manufacture (40-60%), manufacturing (5-15%), and marketing and start-up expenses (10-25%).

Numerous tests have been written on how to organize for, manage, and control innovation. Mueller (1971) states that a better approach to R and D in industry might be how not to organize for innovation. The education process in this country trains creativity out and conformity in (Carney, 1981). How then should management approach this area so vital to the continued survival of an organization--this performance criteria which gives an organization the competitive edge, but only as long at it takes the competition to copy it? Butler (1981), in his review of the composition of groups involved in innovation and strategy formulation, states that appropriate group composition and leadership varies, depending upon the stage of development at which the group is working. He states that any group which has settled into a stable pattern of working will cease to be innovative. In

order to regenerate themselves, leadership rotation and restructuring the group into ones in which all channels are opened, via brainstorming (nominal group technique and quailty circles might work as well) are suggested. Szylagyi (1981) states that the organization that wishes to be innovative must avoid all the trappings of bureaucratic structure, particularly sharp divisions of labor, extensive unit differentiation, highly formalized behavior, and an emphasis on planning and control systems. Above all, he cautions, it must always remain flexible. Peters and Waterman (1982) reiterate this idea in their study of successful, innovative companies. These companies are more "fluid"; they are what Bennis (1969) called adhocracies, as opposed to bureaucracies. The same authors stress the importance of being open to ideas from outside sources, particularly customers. The customer knows what he will buy and is therefore an excellent source of ideas for product development. Excellent, innovative companies, according to Peters and Waterman (1983) will:

1. Have a bias for action ('do it', 'fix it', 'try it').
2. Stay close to the customer.
3. Encourage autonomy and entrepreneurship.
4. Seek productivity through people (respect for the individual).
5. Use a 'hands-on, value driven' approach.
6. Stick to their knitting (know their business).
7. Have a simple form and lean staff.
8. Have simultaneous loose-tight properties.

According to Roberts (1981), the following persons are needed for innovative ideas:

1. Creative scientist or engineer.

2. Entrepreneur (who pushes the idea toward commercialization).

3. Project manager (who focuses on specifics--will it sell? Is is fundable?).

4. Sponsor (an in-house individual who provides coaching and back-up for the scientists and engineers).

5. Gatekeeper (who brings essential information to the technical and marketing organizations).

Schon (1963) states that any new idea either finds a champion or it dies. A champion is one who "provides the energy required to cope with the indifference and resistance that major technical change provokes" (Maidique, 1982). He includes this individual in his key roles in the innovation process:

1. Technological engrepreneur--controls the venture, usually the chief executive officer (CEO).

2. Product champion--risks his/her position and prestige to see the innovation through to successful implementation.

3. Executive champion--controls resource allocation, channels resources to a new innovation.

Quinn (1982) lists the following as blocks to the optimum production and use of technology in American companies: short term management incentives, lack of urgency in research, entrenched ideas and vested interests, aging of key management and operating personnel, and overly long lines of formal authority. The same author suggests establishing a policy framework and "management attitudes" which encourage flexibility, reward those responsible for successful changes and promote cooperation between organizational units, and control the

organization toward its goals so that members are not overwhelmed by short-sighted, quick profit opportunities.

Innovation may be seen in technological and procedural areas. Technological advances in the foodservice industry in recent years include the blast freezer, the microwave oven, conveyorized broilers, energy saving ventilation systems, and circular dish machines and tray liners. Procedural advances may involve a new marketing technique, a change in work flow involved in food processing, or a new incentive system. Innovations in healthcare such as Health Maintenance Organizations (HMO's) and outpatient surgery may also affect the hospital dietary department. Eighty-one percent of the industrial engineers responding to a recent survey stated that capital investment in new or automated machinery (in order to improve productivity) had taken place in their industries within the previous five years ("IE's Describe Productivity Improvement Efforts, Identify Obstacles to Their Success," 1983). Sumanth and Einspruch (1980), however, state that despite the fact that technology is the single most important factor to enhance productivity, 80% of all companies utilize procedure-based techniques.

Measurement

Sherman (n. d.) states that there are three measures of the utility of an innovation--cost, quality, and access. The value placed on each differs, depending upon ones' perspective. Any judgment about innovations is a value judgment. The appraisal of innovation from the economic point of view (as is done by managers) cannot be restricted to physical inputs and outputs (Gold, 1980). White (1975) expands

upon this, stating that the usual output measures used for R and D departments (research reports, research notes, technical memoranda, publications) gives a quantitative guide to quality of the work but is inappropriate to measure productivity. The input measure is often used--resources consumed does not always correlate with the research done. Basic (foundation) research will not result directly in published reports but is none the less vital to the later products and processes which may result. The same author also notes a time difficulty in measurement. Whereas management generally evaluates based upon annual results, a five year trend would be more useful in evaluating R and D functions.

There are other ways to evaluate R and D. Mission-oriented research must be under administrative control in order to obtain results within a reasonable time period (White, 1975). The same author suggests evaluation of research for efficiency on the basis of the following points:

1. Economy of experimentation. Make available any resources that are needed.

2. Scale of experimentation. Conduct each step on the right scale.

3. Tools of research. Make available modern tools as technical aids to efficiency.

4. Assistance to research workers. Have all routine services (photography, microscopy, chemical analysis, etc.) done by assistants.

Other helpful evaluation tools for R and D given by White (1975) include: (1) staff inspection, (2) job evaluation, (3) method studies, and (4) activity sampling. Carney (1981) suggests two ways to

improve productivity: first, capital investment in modern plants and equipment; second, development of innovative processes that allow for economies of production.

Summary

The seven organizational performance criteria are highly interrelated. The criteria on which the most emphasis is placed varies from operation to operation and from one industry to another.

Productivity is the relationship of quantities of outputs to quantities of inputs for the same time period, and a combination of effectiveness and efficiency. Effectiveness is doing the right things, while efficiency is doing things right (Drucker, 1974), or the degree to which a system uses the right amount of resources (Sink, 1983a). Quality is the degree to which a product or service conforms to predetermined standards (Adam et al., 1981), or (at the consumer level), fitness for use (Juran and Gryna, 1980). Quality of Worklife involves the affective responses of participants to living and working in an organizational system (Sink, 1983a). Profitability is the difference between revenue and expenses, and innovation is applied creativity.

Many businesses see profitability as the bottom line. It is possible to be profitable without being productive--in the short run. A new, much-desired product may provide profit; however, the product is unique only as long as it takes for it to be copied. Once competition steps in and challenges the quality or price of that service or product, the operation must be productive in order to remain profitable. Quality must be a part of any productivity measurement program.

The productive plant which produces an inferior product is not likely to remain profitable for long. The relationship of quality of work-life to the other performance criteria is blurry, but there is enough literature proposing a link between the dissatisfied worker and poor performance to make it worthy of consideration to all managers. Innovation is often the key to long-term success in industry.

No one of these criteria is more important to the success of all operations than any other. However, low productivity is a problem, especially in foodservice, but also in all industries nationwide. For that reason, this study emphasizes productivity, but seeks to better understand its role in foodservice by examining current measurement and control practices for all seven organizational performance criteria (see Figure 1 for a summary of the productivity management process).

CHAPTER III

METHOD

Robertson's (1982) findings indicated that food service managers in health care delivery systems are defining and measuring productivity in terms of related performance criteria such as quality, efficiency, and effectiveness rather than as the relationship of outputs to inputs. It is the purpose of this study to carry this status survey one step further; to see how the six other performance criteria are defined and measured when productivity is specifically stated to be output/input.

Research Design

Descriptive status survey was the research design utilized to meet the objectives of the study. Fox (1969) states that descriptive surveys describe a specific set of phenomena at one point in time. Joseph and Joseph (1979) refer to descriptive research as that which systematically describes a situation, area of interest, series of events, opinions, attitudes, or other variable or set of variables in a factual and accurate manner. According to the same authors, description is based on data collected from a representative sample without bias. Descriptive survey was chosen for the study in order to reach a broad spectrum of foodservice professionals working in various sizes and types of hospitals utilizing various foodservice systems.

Sample

The criteria established for participants in the survey were membership in the ADA practice group "ADA members with management responsibilities in health care delivery systems" and current employment in hospital food service management. A mailing list of approximately 3,500 practice group members was obtained from the ADA. Participant selection was made by randomly selecting a name on the first page of the mailing label list, then taking every seventh name thereafter. If the person selected was obviously not employed in a hospital, they were eliminated from the study and the next person on the list was included. Persons to whom the instrument was sent were asked to forward it on to management personnel if they were not familiar with management practices in that hospital. A total of 500 questionnaires were mailed.

Data Collection

Preliminary Study

A pilot study was conducted at a productivity conference sponsored by the ADA's practice group: "ADA Members With Management Responsibilities in Health Care Delivery Systems." A seven page questionnaire (bright orange color) was used which included two pages of demographic data questions and five pages of questions pertaining to evaluation and control of organizational performance. Open-ended questions were used in order to obtain as much information about current practices as possible. The questionnaire required considerable time and thought. Seventy questionnaires were distributed at the

meeting. The compiled data from the 16% responses provided insight and guidelines to the researcher. Based on the data obtained from the pilot study, several questions were omitted completely, and it was decided that the final instrument would have to consist of closed, easily understood questions in order to increase participation. Descriptions of outputs collected, inputs collected, ratios, indices, and other dimensions under each performance criteria were analyzed for possible inclusion in the final instrument.

The Instrument

The research instrument designed for the final study consisted of two main sections: Demographic Data (entitled "General Information") and Performance Criteria. Performance Criteria was divided into seven sections (one for each of the criteria). At the end of the instrument, participants were asked to rate the criteria according to how much time they spent evaluating each, and according to how important they felt evaluation of each is to the successful operation of a food service facility. Comments concerning the definitions used or the survey in general were solicited at the end of the instrument. The instrument was reviewed for validity and reliability by a panel of Oklahoma State University graduate faculty members from the departments of Food, Nutrition and Institution Administration; Hotel and Restaurant Administration; Industrial Engineering; and Statistics.

The instrument consisted of three types of questions. Under "Productivity," respondents were asked to circle the number which corresponded with how often they use the control measures listed. A Likert-type scale was used, ranging from 1 (always) to 5 (never). The

majority of questions used required the respondent to simply check "yes" or "no" or to place a check in the box beside an evaluation or control measure he or she uses. The rating questions required a response using a scale of 1-7. "One" was the number to be given to the criteria on which he or she spends the most time (or feels is most important), and "seven" was to be given to the criteria on which they spend the least time (or feels is least important).

Distribution Procedure

The instrument was printed on three sheets of ivory paper and mailed along with a cover letter explaining the project and instructing the respondents on how to complete and return the questionnaire. Mailing information and codes were printed on the back of the last sheet so that the instrument could be mailed without being placed in an envelope, and could be refolded and mailed back in the same manner.

Data Analysis

Data obtained from the survey were keypunched on computer cards, three cards per respondent, and were analyzed using the Statistical Analysis System (SAS) (Barr and Goodnight, 1972). Frequency distributions showed the occurrence of each method of performance evaluation or control. Chi square was used to study the relationship between selected demographic variables and the methods of evaluation and importance to the various types of foodservice operations. A 5% level of significance was used for the purposes of this study.

CHAPTER IV

RESULTS AND DISCUSSION

Data for the study were obtained via the instrument described in Chapter III, "Methods and Procedures." The questionnaire was mailed to 500 randomly selected members of the ADA Practice Group "ADA Members With Management Responsibilities in Health Care Delivery Systems." The response rate was 24% (N=120). Twenty-one percent (N=109) of the returned questionnaires were usable for analysis purposes. Reasons for exclusion included employment outside the hospital setting, knowledge and answers relating to clinical aspects only, and non-response to one or more pages.

Chracteristics of Survey Participants

Age and Years of Experience

One-half of the responding sample was below the age of 39 years (N=55), and one-half was over 39 years of age (N=54). One-half (N=55) had fewer than 10 years of experience, and one-half (N=54) had 10 or more years of experience.

Degrees Attained and Productivity Training

Sixty-seven percent (N=74) of the respondents listed a bachelor of science degree as the highest degree attained. Thirty percent

(N=33) had master's degrees and one had completed a doctorate. Fifty-five percent (N=61) of the survey participants had no training in productivity measurement, while 44 percent (N=48) had prior training. Examples of the type of productivity training given included college courses in management and engineering, workshops, seminars, contract company training courses, work with a hospital's productivity department, work with a consultant, ADA and American Society for Hospital Foodservice Administrator's (ASHFSA) meetings and ADA Practice Group seminars.

Route to ADA Membership

Fifty-eight percent (N-63) of the respondents listed internshp as their route to membership. Fourteen percent (N=16) completed a three year work experience, 9% (N=10) listed master's degree and six months of pre-planned work experience, and 8% (N=9) completed traineeships. Eight percent (N=9) of the respondents had graduated from CUP programs.

Position Title

The predominant position title of the 109 respondents was that of foodservice director (N=71, 65%). Twelve percent (N=14) are assistant directors, 11% are administrative dietitians, 2 are consultants, and the remaining 8 checked the "other" category under position title. Positions described under "other" included foodservice manager, chief of dietetic services, corporate coordinating dietitian, district manager, and assistant dietitian.

Characteristics of the Institutions

Type of Hospital, Size, and Type of Management

Forty-four percent of the respondents are employed in non-government, non-profit hospitals; 25% are employed in non-federal (state, county, city); and 13% checked "other," which included government-funded, church-operated hospitals, non-profit clinics, long-term care facilities, non-federal district hospitals, and nursing homes. Eleven percent of the respondents are employed in investor-owned institutions, and 4% are in federally-owned hospitals. Fifty-three percent (N=58) of the hospitals have more than 299 beds, while 46% (N=51) have fewer than 299 beds. Eighty-eight percent of the foodservice operations are independently managed, and 11% (N=12) are contracted to foodservice management companies.

Foodservice System

Eighty-nine percent (N=98) of the survey participants manage conventional foodservice systems. Only 10% (N=11) manage systems such as assembly/serve, cook/chill, and cook/freeze.

Performance Criteria

Productivity

Respondents were asked to state how often they use certain input and output control measures in their hospitals' foodservice operation. Answer selections were given using a five-point, Likert-type scale ranging from "Never" to "Always" (see Appendix).

Respondents were asked to circle the point value under the term which best described their use of the particular control (five points for "Never"; one point for "Always").

Inputs - A significant number of respondents are controlling inputs (at least sometimes) by way of the examples given (over 92% in the eight examples which did not involve energy management). The first input control listed was the use of detailed specifications when purchasing equipment and supplies (Table II). Almost all of the participants (96%) answered this affirmatively ("Always," "Usually," or "Sometimes"). Two respondents replied that they rarely use specifications. Ninety-four percent of the respondents do check and appropriately adjust, if necessary, labor usage at least quarterly (input control 2), while 93% of the respondents comparison shop for food and supplies (input control 3).

Input control 4, "take advantage of seasonal food buys," was answered affirmatively again by almost all of the survey participants (96%). A significant difference in the type of hospital using this control was observed ($p=.0016$, $X^2=43.704$, $DF=20$). All of the federally-owned and non-federal (state, county, city) and non-government, non-profit hospitals are taking advantage of seasonal food buys. Eighty-three percent of the investor-owned, and 86% of those classifying themselves as "other" answered the question affirmatively. Three percent of the respondents rarely or never take advantage of seasonal food buys.

Standardized recipes (input control 5) are used in 97% of the institutions involved. The evaluation of kitchen energy costs and

TABLE II

INPUT CONTROLS

Input Control	No. of Persons Responding				
	Always	Usually	Sometimes	Rarely	Never
1. Use of detailed specifications when purchasing equipment and supplies.	55	36	15	2	0
2. Check (and appropriately adjust, if necessary) labor usage at least quarterly.	58	30	16	2	2
3. Comparison shop for food and supplies.	61	39	4	4	1
4. Take advantage of seasonal food buys.	42	50	13	2	2
5. Use standardized recipes.	58	41	8	2	0
6. Evaluate kitchen energy costs at least quarterly.	4	14	20	41	30
7. Monitor energy usage of specific pieces of equipment.	1	9	18	41	40
8. Routinely conduct physical inventory of storeroom.	92	12	3	1	0
9. Monitor breakage and pilferage of supplies.	41	42	18	6	2

TABLE II (Continued)

Input Control	No. of Persons Responding				
	Always	Usually	Sometimes	Rarely	Never
10. Periodically review and revise job descriptions in order to prevent duplication of tasks.	61	42	5	1	0

Note: Some respondents did not answer all questions.

the monitoring energy usage of particular pieces of equipment (input controls 6 and 7) are not commonly practiced. Thirty-three of the respondents are evaluating energy costs at least quarterly, and 28 respondents follow energy usage of particular pieces of equipment. Ninety-six percent (N=101) of the responding sample are conducting physical inventories of storerooms (input control 8). The monitoring of pilferage of supplies (input control 9) is done by 101 of the 109 respondents. Job descriptions are reviewed periodically by 99% of the survey participants. Other items given as input controls by respondents include: portion control, employee selection, quality inspections, work measurement, production vs. usage monitoring, standards of operation, use of work and duty schedules, tray timing, and annual budget preparation. These are primarily labor input controls (employee selection, work measurement, use of work and duty schedules, and budget--which may be used to control labor). Quality inspections and standards of operation, although indirectly related to productivity, are not input controls. Portion control and tray timing are output controls.

Outputs - Positive response to the use of the four output controls given ranged from 90-98%. A significant association was observed between the use of daily census reports (output control 1) (Table III) and types of foodservice systems ($p=.0010$, $X^2=10.881$, $DF=1$). Ninety-eight percent of those employed in conventional foodservice systems utilize this control, while 81% of those in other systems (assembly/serve, cook/chill, cook/freeze) use census reports. This is understandable, since food production in cook/chill and

TABLE III

OUTPUT CONTROLS

Output Control	No. of Persons Responding				
	Always	Usually	Sometimes	Rarely	Never
1. Check daily census reports and plan production accordingly.	72	27	7	1	2
2. Keep production records for cafeteria and catering as well as patient meal service.	76	20	8	3	0
3. Check production records at least quarterly to see that production is appropriate for demand in cafeteria.	46	37	11	7	3
4. Have a system for using leftover bulk foods from patient meal service.	68	28	10	1	0

Note: Some respondents did not answer all questions.

cook/freeze systems is done 24 or more hours before it is to be served and must, therefore, be based on census forecasting rather than on actual census. Output control 2, the keeping of production records for cafeteria, catering, and patient meal service, was answered affirmatively by 104 of the 109 participants. Nearly all (N=106) of the 109 respondents have a system for using leftover bulk food from patient meal service. A significant difference was seen in the types of foodservice systems using this control ($p=.0071$, $X^2=12.064$, $DF=3$). All hospitals using conventional systems (N=97) reuse leftover bulk food on a regular basis. In contrast, only 9 of the 11 hospitals using other systems practice this control. This difference may be attributable in part to the fact that bulk food in other systems (cook/chill and cook/freeze) has been held in the chilled or frozen state prior to plating. Concern over microbiological safety may discourage its reuse. Ninety percent (N=99) of the respondents are checking production records for the cafeteria at least quarterly to see that production is appropriate for demand.

Other output controls described by respondents include standards for issue of products according to recipe quantity, computerized forecasting, quality monitoring, long-range forecasting, menu mix, and sales analysis and labor hour cuts when census is low. Computerized (and long-range) forecasting reduce overproduction; menu mix and sales analysis coordinates production and sales. These, therefore, are valid output controls. Standards for issue of a product according to recipe quantity is an output control for the storeroom or ingredient room only; it is an input control for the dietary operation in general. Quality monitoring is indirectly related to

productivity but is not an output control. Labor hour cuts with low census is an input control.

Ratios and Indexes Used to Assess Productivity - The second section under "Productivity" asked if the respondent is using ratios and/or indexes by which to assess productivity, and if so, which ones. Eighty-two percent (N=90) stated that they are using ratios and indexes. The most commonly used ratio is meals/total food cost (N=71). This figure is easily determined by checking production and purchasing records (95% of the respondents stated that they are keeping production records for patient and non-patient meal service). The use of this ratio is significantly affected by the years of experience ($p=.0524$, $X^2=3.764$, $DF=1$). Seventy-four percent of those with 10 or more years of experience are using this ratio. The second most commonly used ratio, meals/labor hours paid, is used by 57 of the 109 respondents. This is easily derived from labor and production records. Use of this ratio is significantly associated with training in productivity measurement ($p=.0584$, $X^2=3.581$, $DF=1$) and with the years of experience ($p=.0271$, $X^2=4.883$, $DF=1$). Meals/labor hours worked is used by 53 of those responding. It involves subtracting out sick leave, vacation time, and other paid hours that are not actually worked, and is a more accurate reflection of an operation's productivity than is meals/labor hours paid.

The ratio patient days/hours worked (used by 34% of the respondents) is most common in foodservice systems other than conventional ($p=.0347$, $X^2=4.461$, $DF=1$), and with respondents with 10 or more years of experience ($p=.0131$, $X^2=6.616$, $DF=1$). Training in productivity

measurement also influenced the tendency of a respondent to answer affirmatively to this ratio ($p=.0330$, $X^2=4.546$, $DF=1$). Forty-five percent of the respondents with training are using it, while only 26% of those without training are doing so. Patient days is preferred over meals as an output measure by many foodservice professionals because of the ambiguity associated with the term "meal." However, much of the literature on productivity in foodservice uses meals as the output measure. Patient days is often based on a midnight census which is not reflective of the amount of foodservice activity during the day. Meals/man-minutes is used by 33% of the respondents. A significantly higher number of systems other than conventional are utilizing this ratio ($p=.0228$, $X^2=5.183$, $DF=1$).

FTE's (Full Time Equivalent)/specific task (an inverse ratio--inputs/outputs) is used by 14% of the survey participants (N=16), with 36% of those in systems other than conventional using it, while only 12% in conventional systems are doing so ($p=.0321$, $X^2=41594$, $DF=1$). FTEs are a common labor recordkeeping unit in hospitals; however, the low usage rate of this ratio may be related to the degree of work measurement knowledge necessary to analyze a task in such detail and by the expense involved in doing so. Eighty percent of the respondents employed in federally-owned institutions and 8% of those in non-government, non-profit institutions are using this ratio. The pilot study showed an association between the use of the inverse of the ratio, ratio/actual man-minutes, and federally-owned (Veteran's Administration) hospitals. The use of this ratio by non-government, non-profit institutions was unexpected by the researcher. Perhaps productivity training obtained during employment in federal

facilities is being applied during later employment in non-government, non-profit hospitals. It is also possible that literature using this ratio is widely available to the public sector. The type of foodservice system also significantly impacted upon the use of rations served/actual man minutes ($p=.0157$, $X^2=5.840$, $DF=1$). Twenty-seven percent of those employed in non-conventional systems are using this ratio, while only six percent of those in conventional systems are using it. No explanation is attempted for this link, except perhaps the possibility of an association between systems used and hospital type. No tests were run to determine if such a correlation existed. Few respondents stated that they are using the inverse of any of the seven ratios given. This researcher believes, based on the literature review, that in reality inverse ratios (input/output) are much more commonly used than the reverse.

Several significant associations were observed in the use of particular ratios and 10 or more years of experience in systems other than conventional (assemble/serve, cook/chill, cook/freeze). Respondents with fewer than 10 years of experience are primarily using meals/total food cost (56%), meals/labor hours paid (41%), and meals/labor hours worked (40%). Total respondents in this category stating that they do develop ratios and indices by which to assess productivity was 81%, compared with 83% of those with 10 or more years of experience.

In conventional systems, the ratio most commonly used is meals/total food cost (65%). Fifty-one percent are using meals/labor hours paid, and 46% are using meals/labor hours worked. Eighty percent of the respondents in conventional systems are using ratios and indices,

compared with 100% of the respondents in other systems. Table IV summarizes significant associations found in ratio usage.

Effectiveness

Under the criteria "Effectiveness," respondents were asked whether or not they set specific goals for their operation and how goal attainment is evaluated. Ninety-five of the 109 respondents answered that they do set specific goals. A significantly higher number of those with training in productivity measurement set such goals than those without training ($p=.0019$, $X^2=8.872$, $DF=1$). Since goal setting is a much discussed topic in college courses and at continuing education seminars, this link was not unexpected. Two of the methods were positively affected by training in productivity measurement: breaking goals into subgoals ($p=.0588$, $X^2=3.571$, $DF=1$) and the use of personnel statistical reports ($p=.0001$, $X^2=15.524$, $DF=1$). A significant association was also observed between type of hospital and the use of evaluation meetings ($p=.0223$, $X^2=13.123$, $DF=5$). They are used by institutions classifying themselves as "other" (73%), non-federal (state, county, city) (42%), federally-owned (40%), non-profit, non-government (39%), and investor-owned (8%).

Quality

Respondents were asked if they have quality standards specific to their operation, and if so, by whom they are developed, the means of quality control, the involvement of employees in quality standards, and the organizations which govern quality standards in this

TABLE IV

SIGNIFICANT ASSOCIATIONS FOUND IN RATIOS USED

Ratio Used	Factors Showing Positive Correlation	Total % of Respondents Using
Meals/total food cost (PFPR). Valid only if figured in constant dollars.	Experience (p=.05). Respondents with 10 or more years of experience more likely to use this ratio.	65
Meals/labor hours paid (PFPR). Less accurate than meals/labor hours worked.	Experience (p=.02). Respondents with 10 or more years of experience more likely to use this ratio.	52
	Training (p=.05). Respondents with training in productivity measurement more likely to use this ratio.	
Meals/labor hours worked (PFPR). Labor hours paid minus sick leave, vacation leave, and any other time paid but not worked.	No significant associations.	48
Patient days/hours worked. Most accurate when based on an a.m. or mid-day census.	Experience (p=.01). Respondents with 10 or more years of experience more likely to use this ratio.	34
	System (p=.03). Systems other than conventional more likely to use this ratio.	

TABLE IV (Continued)

Ratio Used	Factors Showing Positive Correlation	Total % of Respondents Using
	Training (p=.03). Respondents with training in productivity measurement more likely to use this ratio.	
Meals/man-minutes (PFPR). Some respondents prefer minutes over labor hours as a labor input measure.	System (p=.02). Respondents in systems other than conventional more likely to use this ratio.	33
FTEs/specific task. An inverse ratio.	System (p=.03). Respondents in systems other than conventional more likely to use this ratio.	14
Rations/served/actual man-minutes (PFPR).	Hospital Type (p=.0001). Federal institutions most like to use this ratio, followed by non-government, non-profit.	8
	System (p=.01). Respondents in systems other than conventional more likely to use this ratio.	

Note: Most respondents checked more than one response; PFPR = Partial-Factor Productivity Ratio.

operation. Ninety-eight percent (N=107) of the respondents indicated that they have quality standards specific to their operation. In most operations (54%), standards are developed by the foodservice director, followed by 44% having standards developed by a management team. Twenty percent have assistant directors who set the standards, and in 13%, administrative dietitians do so. Others setting standards are quality assurance coordinators (11%), production managers (10%), foodservice management companies (3%), and others (8%). Others mentioned included the Joint Commission on Accreditation of Hospitals (JCAH), state health departments, clinical dietitians, supervisors, corporate dietitians, and clinical coordinators. Quality control measures in which significant associations were observed are shown in Table V. Tray audits are more often used by dietitians over the age of 39 and with 10 or more years of experience than by their younger, less experienced counterparts. They are also more commonly used in large hospitals than in small hospitals, a fact which may be related to the loss of control associated with a larger volume of output. The link between temperature check of food on wards and periodic checks of food delivery time with hospital type may signal a link between hsopital type and foodservice system used. The association of these controls with age and experience may be explained by the fact that experience has shown a need for such on-going formal control systems or perhaps dietetics' education is not stressing quality control as it has in the past.

A significant association existed between training and periodic survey of customers and patients as to quality of food and service. This may reflect the current popularity of surveys as a status

TABLE V

SIGNIFICANT ASSOCIATIONS FOUND IN QUALITY CONTROLS

Quality Control	Factors Showing Positive Correlation	Total % of Respondents Using
Tray audits	Years of Experience (p=.0042) (10 or more years more like to use)	84
	Age (p=.0195) (over 39 years more likely to use)	
	Size of Hospital (p=.0323) (large hospitals more likely to use)	
	Registration (p=.0159) (registered more likely than non-registered to use)	
Temperature check of food on wards	Age (p=.0141) (over 39 years more likely to use)	77
	Years of Experience (p=.0141) (10 or more years more likely to use)	
	Type of Hospital (p=.05) (order of use: federal, non-government, non-profit, non-federal, "other," and investor-owned)	

TABLE V (Continued)

Quality Control	Factors Showing Positive Correlation	Total % of Respondents Using
Periodic checks of food delivery time	Years of Experience (p=.0391) (10 or more years more likely to use)	78
	Type of Hospital (p=.05) (order of use: federal, non-government, non-profit, "other," non-federal, and investor-owned)	
Periodic survey of customers and patients concerning quality of food and service	Training in Productivity Measurement (p=.0138) (with training more likely to use)	89
Unannounced sanitation inspections	Years of Experience (p=.05) (10 or more years more likely to use)	81

assessment instrument. Unannounced sanitation inspections were also associated with years of experience, as were tray audits, temperature checks of food on ward, and periodic checks of food delivery time. The data suggest that foodservice professionals responding to the questionnaire who had 10 or more years of experience are more actively controlling quality via the formal methods given. Quality standards are being discussed with employees beyond in-service training by 91% of the respondents. The director was given as the person most often responsible for quality control and JCAH is the organization most often governing quality standards (Tables VI and VII).

Efficiency

In this section of the questionnaire the researcher sought to determine how closely the four resource categories (materials, labor, capital, and energy) are being followed in foodservice. Resources were grouped for selection based upon data provided by respondents in the pilot study. Resources monitored on a regular basis varied according to hospital type, foodservice management, foodservice system, age of the respondent, training, and route to ADA membership (Table VIII). Most respondents (72%) are following labor, materials, and capital and not energy (as previously shown in the input control portion of the questionnaire). Sixty-seven percent (N=74) of the respondents do compare resource use with resource utilization targets.

Quality of Worklife

Respondents were asked if they measure quality of worklife (QWL) in their operation and then were asked to check the means by

TABLE VI

PERSON RESPONSIBLE FOR QUALITY CONTROL

Person or Persons	N	Percentage of Hospitals
Director	44	40
Management Team	38	34
Assistant Director	17	15
Production Manager	17	15
"Other"	17	15

*Others given were the same as listed under "Quality" in this chapter in answer to the question "Who develops standards?"

TABLE VII

ORGANIZATIONS GOVERNING QUALITY STANDARDS

Organization	N	Percentage of Hospitals
JCAH	96	88
State health codes	88	80
City health codes	42	38
County health codes	40	36
"Other"	13	11
Contract company standards	10	9

*Others included: SERP, SIR, In-House, Administration, ADA, Federal Sanitation Guidelines, Medicare, Medicaid, Veteran's Administratation, SNF, and ICF.

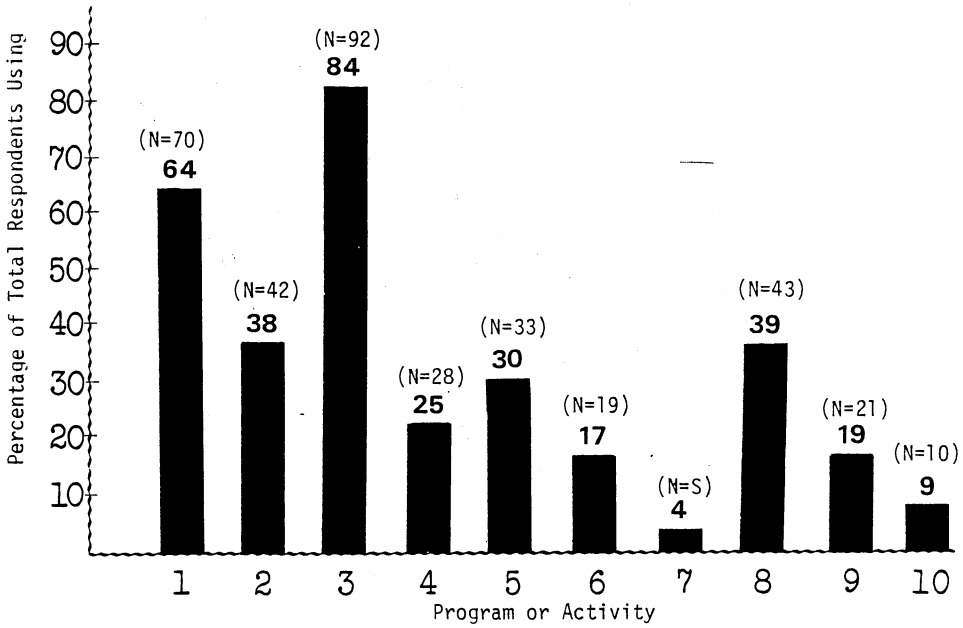
TABLE VIII

RESOURCE CONTROL

Resources Controlled	Factors Affecting Use	Percentage of Total Respondents Using
Labor, materials, capital, and energy	Hospital Type (p=.0010) (Federal and "other" institutions most likely to follow all resources)	11
Labor, materials, capital	No significant associations	72
Labor, materials, energy	No significant associations	.91
Materials and labor	Age (p=.05) (over 39 years more likely to follow)	22
	Experience (p=.001) (10 or more years more likely to follow)	
	Foodservice System (.047) ("other" systems more likely than conventional to follow)	
	Contract foodservice (p=.0045)	
	Productivity training (p=.039) (with training more likely to be using than those without training)	
Materials only	No significant associations	1

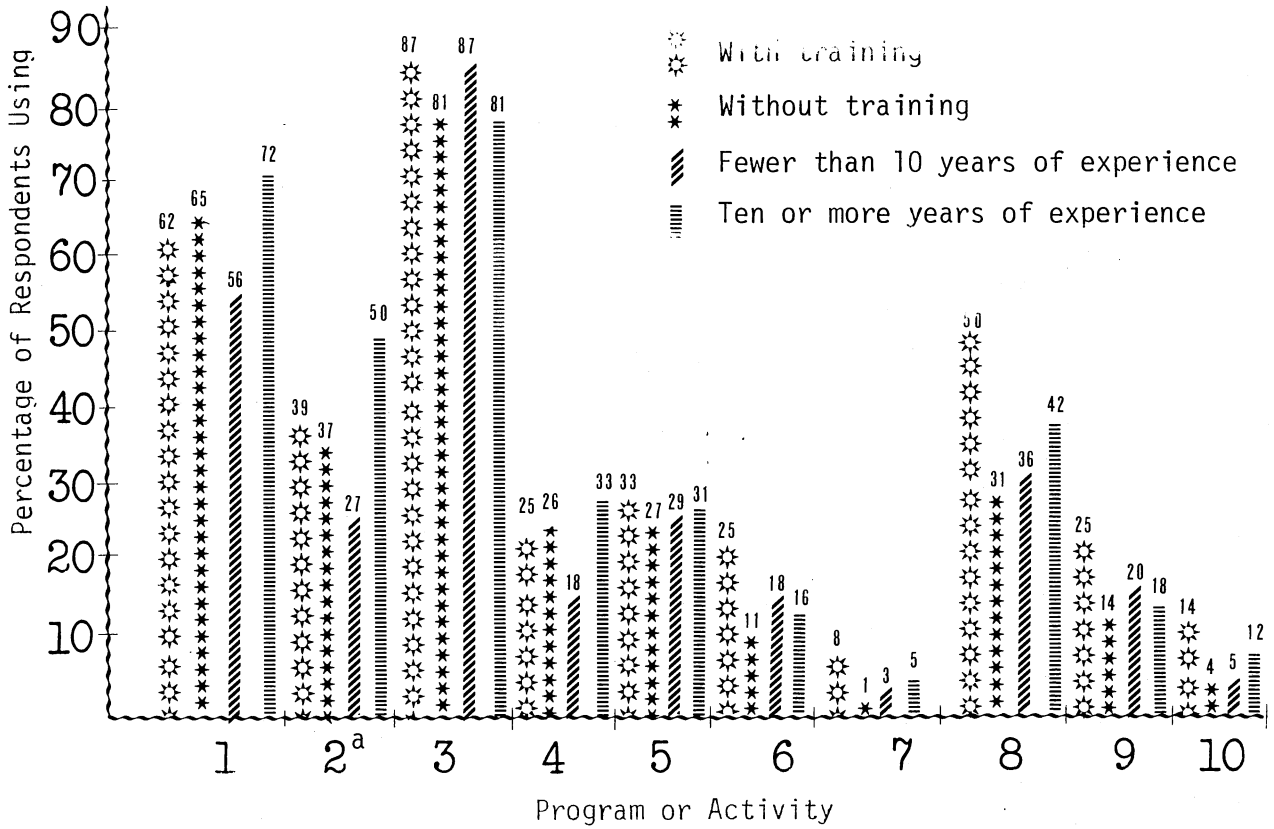
which they are assessing QWL. Sixty-six percent of the respondents checked that they do measure the quality of worklife. The means by which this is accomplished include: monitoring absenteeism and turnover (N=94), subjectively evaluating by listening to employees (N=84), subjectively evaluating based upon employee participation and cooperation (N=65), and the use of written job satisfaction questionnaires (N=18). Seventy-one percent of the respondents (N=78) checked that they do link performance to rewards. A significant association ($p=.0236$, $X^2=5.126$, $DF=1$) was shown between those over 39 years of age and the use of subjective evaluation based on participation and cooperation. Fifty-five percent of the respondents in the same age group are using written job satisfaction questionnaires.

From a list of 10 incentives/motivating factors, the respondent was asked to indicate those that he/she performs or uses in his/her operation. Figure 2 shows total responses to these factors, while Figure 3 shows responses by years of experience and productivity training. There was a significant association ($p=.056$, $X^2=5.745$, $DF=2$) between the measurement of QWL and the size of the hospital. Seventy-six percent of the respondents employed in hospital with fewer than 299 beds are measuring QWL, while only 58% of those in larger hospitals are doing so. This can perhaps be explained by the additional paperwork and amount of time required where staffs are large. Often, too, in large hospitals the director (which most of the respondents are) does not have direct day-to-day contact with employees during which he/she could subjectively evaluate QWL. Training in productivity measurement positively affected the use of written job satisfaction questionnaires ($p=.0143$, $X^2=8.504$, $DF=2$).



1. Raises based upon performance appraisals
2. Commendation letters
3. Verbal recognition
4. Merit pay for management staff
5. Performance awards (non-monetary)
6. Performance awards (monetary)
7. Formal incentive system
8. Suggestion system
9. Quality circles
10. Incentive system

Figure 2. Incentives/Motivational Programs and Activities



[a]A significant relationship was found between the use of commendation letters and 10 or more years of experience.

1. Raises based on performance appraisals.
2. Commendation letters
3. Verbal recognition
4. Merit pay for management staff
5. Performance awards (non-monetary)
6. Performance awards (monetary)
7. Formal incentive system
8. Suggestion system
9. Quality circles
10. Incentive system

Figure 3. Use of Incentive/Motivation Programs and Activities

Commendation letters are more often used by respondents with 10 or more years of experience than by those with fewer than 10 years of experience ($p=.0148$, $X^2=5.942$, $DF=1$). A 1978 Restaurants and Institution survey ("Fourth Annual Jobs Report," 1982) showed that "feelings of accomplishment" had risen 10 percentage points as the most important reward workers get from their jobs. Money, on the other hand, dropped three percentage points as an important reward. The data seems to indicate a slight movement away from monetary awards and toward recognition and involvement. Raises, however, are still linked to performance appraisals. Sixty-three percent of the industrial engineers responding to a recent survey favored personal recognition as a motivator compared with 58% favoring monetary rewards and 14% favoring promotions ("IE's Describe Productivity Improvement Efforts, Identify Obstacles to Their Success," 1983). Because of the changing values of today's workers, this trend merits further investigation. Suggestion systems are the most popular of the motivation/participation techniques given in the QWL section of the instrument. The reader is urged to note the descriptions given in Table IX by respondents who did not give any indication of the number of suggestions accepted each year in their organization (system handled by the state, newsletter answer suggestions, done by administration--director does not know how many have been accepted, system failed because supervisors destroyed credibility, no reward--few suggestions). One respondent stated that no suggestions had been accepted, but the reward is a pay increase by the hospital. Respondents who are rewarding suggestions (even if only verbally) and who are handling the system within the department seemed more willing to

TABLE IX

SUGGESTION SYSTEM (N=43)

No. of Suggestions Accepted Annually	Reward Given
--	Suggestions printed in newsletter
--	System handled by the state
--	Suggestion box, newsletter answers
--	Done by administration, director not aware of how many accepted
--	Failed, supervisors destroyed credibility
--	Free meals given and verbal recognition
--	No reward, few suggestions received
0	Hospital gives pay increase
1	$25.00 award
2	Monetary award
2	Major ones accepted (no reward mentioned)
3-4	Verbal recognition
4	Monetary
4-5	Paid with time off, free meals, letter of recognition
4	Free meals, posted recognition
5	Reward ranges from key chain to monetary
5-6	Recognition
6	Department recognition and small prize
6	Token gift, monetary if adopted
6-8	Verbal and article in newsletter
8-10	Involvement in menu development and schedule changes
10	Verbal recognition
12	Paid days off
13	$25.00 bond, $100 for best yearly suggestion
20	No reward
25-30	Recognition or monetary award
1-2 per week	Verbal recognition

Note: -- indicates that no number was given; some respondents checked suggestion system but gave no description and no number.

share numbers with the researcher. The literature on reward systems stresses the importance of closely linking the reward to the reason for that reward. A loosely administered suggestion system handled outside the workers' immediate department and resulting in no reward or vague rewards at a later date is not likely to be successful. (See Tables IX, X, and XI for a summary of these motivation/participation techniques.)

Innovation

Respondents were queried as to how they promote innovation. A list of techniques to promote innovation was provided and respondents were asked to check the ones they use. There was a significant association between productivity training and the use of brainstorming sessions to promote innovation ($p=.0017$, $X^2=9.815$, $DF=1$). As might be expected, there were also significant associations between the size of the hospital and the addition of a computer (or word processor) ($p=.0144$, $X^2=5.993$, $DF=1$) and the installation of a new meal delivery service ($p=.0400$, $X^2=4.219$, $DF=1$). Larger hospitals generally have more working capital from which to purchase such items, as well as a greater need for them. Some comments received as "other" innovative additions included: completely new kitchen, candlelight dinners for new parents, new services, new cafeteria foodservice, new supervisory structure, and stocking procedures for floor nourishments.

Profitability

The pilot study indicated that exceeding the budget in a foodservice department generally results in one of the following:

TABLE X

QUALITY CIRCLES (N=21)

1. Employee participation group.
2. Two on-going quality circles.
3. Quality circles with supervisors only.
4. Quality circles with first line supervisors.
5. Nursing and dietary quality circles.
6. Problem solving, bottom-up system.
7. Problems solved by personnel with supervisors.
8. Monthly area meetings.

Note: Some of the participative management methods are not quality circles, but do involve employees in decision making.

TABLE XI

INCENTIVE SYSTEMS (N=10)

1. Safety contest and monetary rewards for suggestions.
2. Bonus program based on performance.
3. Financial bonus for best attendance.
4. Recipe and work simplification contests.
5. Employee of the Month receives one day off with pay, $25.00 gift certificate, private parking space, and one week of free meals.
6. Merit pay raise, promotion.

nothing, investigation of causes and budget readjustment, submission of written justification to administration, demerits, cut-off of funds, or price increases. In the final study, responses were: has never happened (N=18), nothing in particular (N=10), investigation of causes and budget readjustment (N=60), submission of written justification to administration (N=48), and demerits (N=2) and price increases (N=7). There was a significant negative association between the size of the hospital and the answer "has never happened" ($p=.0426$, $X=6.310$, $DF=2$). Smaller hospitals were more likely to answer this question affirmatively. Investigation of causes and budget readjustment occurs in half of the non-federal (state, county, city), half of the non-government, non-profit, 66% of the investor-owned hospitals, and 80% of the "other" institutions.

Participants were also asked how they determine meal prices in their establishments. Fifty-three of the 109 respondents stated that food cost plus markup is used; 26 responded that food plus labor costs is used; one respondent stated that prices are state regulated; and 11 respondents checked that their institutions do not charge for patient meals and do not have cafeterias. Ten respondents checked "other" as the answer to this question, and elaboration included such points as: food cost times 2 for labor, plus 10-15% for waste and condiments minus 30% hospital subsidy, food cost plus supply and labor costs plus overhead charge, food plus labor and supplies (plus mark-up for cafeteria), raw food cost times 3, cafeteria=food cost only, employees charged for food cost only, hospital finance department determines prices, sometimes whatever the market will bear. None of the respondents in contract operations checked "do not charge

for meals and do not have a cafeteria." Ten percent of the non-contract respondents answered this positively ($p=.0339$, $X^2=10.422$, $DF=4$).

A significant association was also observed between federal institutions and a positive response to this question ($p=.0007$, $X^2=30.393$, $DF=10$). The selection "do not charge for meals and do not have a cafeteria" was included in this list because this response was often received by dietitians employed in federally-owned hospitals in the pilot study. The fact that 36% of the respondents checking this were employed in investor-owned institutions was completely unexpected and not understood by the researcher. This question may have been misinterpreted.

Performance Criteria Ranking by Time Spent and Importance

The seven performance criteria were ranked the same on the basis of time spent in evaluation and in importance to the successful operation of the foodservice establishment, with the exception of quality of worklife and innovation (Figure 4). Quality of worklife was ranked fifth in terms of importance and sixth in terms of time spent in the operation. Conversely, innovation was ranked fifth in terms of time spent, but sixth in terms of importance to the operation.

Quality clearly emerged as the most important criteria, both on the basis of time spent and importance. This was followed by productivity. Three significant associations surfaced in relation to criteria ranking. First, those respondents who completed master's degrees spent more time evaluating productivity than those who

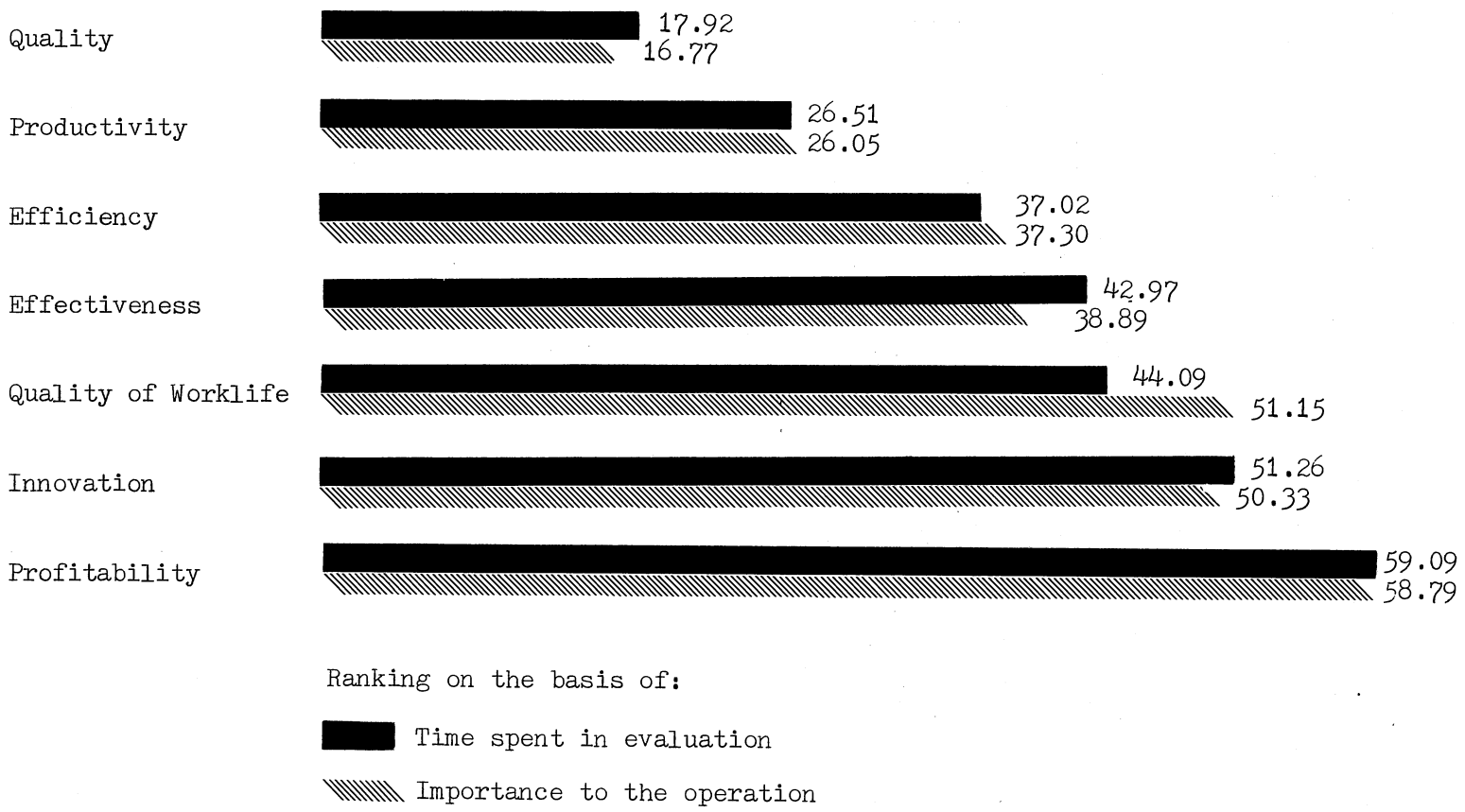


Figure 4. Performance Criteria Ranking

completed internships. Secondly, differences were evident among the various types of hospitals in how they ranked productivity and quality of worklife. Investor-owned hospitals ranked productivity most important; "other" institutions ranked it second in total points, federally-owned was third; non-federal (state, county, city) fourth; non-government, non-profit rated it lowest. Ranking quality of worklife as most important were non-federal (state, county, city) hospitals, next was non-government, non-profit, then "other" institutions, investor-owned; and, finally, federally-owned.

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND IMPLICATIONS

The objectives that guided this study were: to identify current organizational performance evaluation methods in the hospital foodservice industry, to identify demographic variables which affect these practices, and to determine the perceptions of hospital foodservice professionals concerning the amount of time they are spending evaluating each criteria and the importance of each to the successful operation of a foodservice establishment.

To accomplish these objectives, a closed-question instrument was mailed to randomly-selected members of the ADA Practice Group "ADA Members With Management Responsibilities in Healthcare Delivery Systems." One hundred and nine usable responses were received and analyzed using frequency distribution and chi square.

Demographic Description of the Sample

Respondents were one-half below the age of 39 and one-half above; one-half had fewer than 10 years of experience and one-half had 10 or more years of experience. One hundred three of the 109 respondents were registered dietitians, and two-thirds held the title of director.

Institutions represented included federally-owned, non-federal (state, county, city), non-government, non-profit, and investor-owned hospitals and several "other" institutions such as nursing homes,

clinics, and long-term care facilities. Various sizes of hospitals were represented, as well as foodservice systems. Fewer than one-half (N=48) of the respondents had training in productivity measurement.

Performance Criteria

A significant number of respondents are controlling inputs (at least sometimes). Energy costs are followed by only 38 of the 109 respondents. Twenty-eight respondents are aware of energy usage of particular pieces of equipment, and only 14 stated that they keep records on the amount of energy used in their operations. It is possible that although respondents may know energy usage of equipment, records may be kept by other hospital departments (such as engineering, maintenance).

Outputs, too, are being followed closely. Yet, despite the prevalence of input and output controls, only 82% of the respondents are plugging the information into ratios and indexes by which to assess overall productivity. Without a standard productivity value, no comparison can be made between hospitals of similar size and nature, or between one period and another. The information being collected must be operationalized. In a speech given at the Oklahoma Dietetic Association's semiannual meeting in October, 1983, Aimee Moore stressed the importance of hospital foodservice professionals being aware at all times of the productivity of their operations. New financial constraints put on hospitals by the appearance of diagnostically related groups (DRG's) means that administration will be calling on foodservice directors to keep staffs as lean as possible. Directors must know the overall productivity of their operations in order to control

overexpenditures in any of the four resource areas. The data indicate that no one productivity ratio is standard. The most commonly used ratio by respondents, meals/total food cost, is artifically affected by inflation, poor crop seasons, and other cost factors which would cause comparisons from region to region or between one period and another to be useless. Food cost must be calculated in constant dollars in order for this to be a valid partial factor productivity ratio. Information for the ratio meals/labor hours paid is easily obtained. Although not as accurate as meals/labor hours worked, it is helpful in determining an approximate productivity figure.

Training was the variable having the most profound effect on the evaluation of effectiveness. If, by training foodservice professionals, we make them more aware and better able to assess effectiveness, clearly more and better training is indicated.

Quality is extremely important to survey participants. In addition to minimum quality standards set by JCAH, state and local health codes, and contract management companies, 98% of the respondents have specific standards for quality in their operations. Foodservice directors and/or a team of management personnel generally set these organization-specific standards. The data show that respondents over 39 years of age, and with 10 or more years of experience, are using the formal quality control measures to a greater extent than the younger, less experienced group. Tray audits are being used more in large hospitals than in those with fewer than 299 beds. Federal and non-government, non-profit hospitals were most likely to be using temperature checks of food on the ward and periodic checks of food delivery time. Respondents with productivity training are surveying customers

and patients as to the quality of food and service more than those without training.

Of the four resource areas (materials, labor, capital, and energy), use of materials, labor, and capital are the most commonly followed. Only 13 of the 109 respondents are following all four resource groups.

The quality of worklife is being measured more often in hospitals with fewer than 299 beds than in larger hospitals. As stated in Chapter IV, this may be due to the complexity of formal measurement and the fact that directors have less contact with employees in large hospitals.

The relationship between training and the use of brainstorming sessions to promote innovation reflects the current movement toward participative management in management courses and professional seminars. Larger hospitals are more actively promoting innovation and more actively practicing it (although differences between large and small hospitals were significant at the .05 level only in the two "high cost" items of computers and meal delivery systems). The use of new scheduling procedures was evenly split between large (over 299 beds) and small (under 299 beds) hospitals. Small hospitals can be innovative even though they often lack the working capital available to larger institutions.

The most common results of exceeding the budget in hospital dietary departments, according to survey participants, are investigation of causes and budget readjustment (N=60) and submission of written justification to administrators (N=48). If hospitals are inherently inefficient and run less competitvely than profit-motivated businesses

(Berman and Weeks, 1982), perhaps the lack of strict budget control is a cause. However, the reader is urged to note that the use of budget readjustment is most commonly seen in those institutions classified as "other" (many of which are for profit) and in investor-owned hospitals.

Recommendations

Questionnaire

Although the researcher took precautions to examine the validity, reliability, objectivity, and applicability of the data gathering instrument, a few points on which clarity could have been improved surfaced during data analysis. These points are outlined below to serve as a guide or as suggestions for future researchers:

1. On question 3, page 1, under registration status, respondents were asked if they were registered or non-registered, and if registered, whether they attained that status via the grandfather clause or the registration exam. Many respondents checked registered but did not specify route of the registration, thereby making comparisons between the two routes impossible.

2. Question 6, page 1 asked if respondents had 1-5, 5-10, 10-15, or 15 or more years of experience. Since these categories overlap, respondents with exactly 5, 10, or 15 years of experience could have answered in one of two ways. When the data was collapsed for statistical analysis, two groups were used: fewer than 10 years of experience and 10 or more years of experience. This eliminated the problem, except with those respondents having exactly 10 years of experience.

3. The word "church" was used as an example of a non-government, non-profit hospital in question 7 on page 1. However, several respondents were working in other types of non-government, non-profit hospitals and classified themselves as "other" because they were misled by the word "church." The researcher grouped all non-government, non-profit hospitals together for analysis.

4. Under Quality of Worklife (section 5, page 4), the respondent was asked whether or not he/she uses a "formal" incentive system and whether he/she uses an incentive system. By "formal" incentive system, the researcher was attempting to ascertain whether any variation of the incentive systems used in industry (such as Scanlon, Rucker, or Improshare) has been applied to their foodservice. The word "formal" was not explained; therefore, many respondents who checked "formal" incentive system went on to explain that, for example, their suggestion system was an incentive system. Thus, the information desired was not obtained.

5. In questions 8 and 9 on page 5 respondents were asked to rank the criteria according to how much time they spend in evaluation of each and how important each is to the successful operation of a foodservice establishment. Many respondents gave the same ranking to more than one criteria. This meant that in analysis, a point average had to be calculated for those variables ranked equally. This was at times difficult when respondent rankings were not consecutive (for example: 1, 2, 2, 2, 3, 6, 7).

Additional Limitations of the Study

1. The pilot study was conducted at a conference sponsored by the

same practice group which was polled in the final study. The researcher asked the question concerning previous training in productivity measurement in an attempt to identify respondents who may have participated in the pilot study and therefore should not be included in the final study. One respondent referred to the conference, but made no mention of participation in the pilot study. Since the pilot study only involved a portion of those attending the conference, it was assumed that this respondent did not participate and her responses were included.

2. In the ratio section of the questionnaire, respondents were asked to check ratios which they use in their operation. Since total factor productivity indices include all inputs (not just labor and materials as listed), ideally a list including capital and energy ratios would have been used. Since no respondents to the pilot study were using such ratios and since such a list would have been very long, it was decided to list only those ratios received in the pilot study.

3. Due to time constraints, no follow-up mailing was done. The researcher acknowledges that those who responded without a follow-up reminder were probably more interested in the subject of performance control and may be more actively following it than non-respondents or others in the hospital foodservice field. Of the five federally-owned institutions represented, three must submit written justification to administration.

Although food cost plus mark-up was the answer most often given to the question, "How do you determine meal prices?" many variations of this were listed by respondents in the space provided. This researcher theorized that the answer "Do not charge for patient meals and do not

have a cafeteria" would be significantly unassociated with federally-owned hospitals; however, 36% of the respondents checking this response were investor-owned hospitals (compared to 27% of the federally-owned). No attempt is made to explain this by the researcher.

Foodservice professionals responding to this study ranked Quality as the most important criteria, and also as the criteria they spend the most time evaluating. Quality was followed by Productivity in both importance and time spent. A discrepancy existed between the importance of Quality of Worklife and the amount of time spent evaluating this criteria. More time is spent in the evaluation of Innovation than Quality of Worklife.

Recommendations Based on the Results of the Study

Based on the results of the survey, the researcher makes the following recommendations:

1. Although respondents are controlling inputs and outputs, standardization is needed in the ratios being used to assess productivity. Foodservice and hospital organizations must collaborate to develop a universally accepted definition of the term "meals" if, in fact, this is to be used as an output measure. By standardizing ratios, a data base can be accumulated so that comparisons can be made between similar hospital sizes, systems, and types.

2. Educational materials to accomplish this standardization must be developed and promoted within the profession via continuing education seminars.

3. Rising energy costs and the apparent lack of knowledge concerning energy usage in the kitchen indicate a need for more awareness of this input by foodservice professionals. Although the industry currently focuses on labor productivity (due to its labor intensive nature), a total factor productivity ratio involves all four resource categories. Labor intensity should not preclude control of these other resources.

4. It appears that formal quality control measures are used more often by more experienced foodservice professionals. Further study concerning quality control methods and philosophies of entry-level dietitians may be indicated.

5. There is a need for clarification of the term "Quality of Worklife," and for further research concerning current understanding of QWL in foodservice operations. Because quality of worklife encompasses organizational climate, motivation, commitment, satisfaction with job characteristics, pay, and social interaction, as well as many other factors, no one best instrument exists for its measurement. The development of a general instrument specific to the foodservice industry should be a topic of future research on the topic of quality of worklife.

6. There is also a need to evaluate hospital foodservice professionals' knowledge concerning the financial situation of their institutions. Hospitals must generate revenue even though they are not operating "for profit" in order to keep pace with the communities which they serve. A foodservice department which recovers only food costs is pulling revenue from some other "responsibility" center within the hospital. With the advent of Diagnosis Related Groups and the

possibility of further government control of hospital charges, foodservice directors will increasingly be asked to justify their services. The ability to justify costs and expenses of the dietary department is dependent upon detailed financial recordkeeping.

7. Further study concerning the discrepancy between the importance of quality of worklife and innovation and the time spent evaluating each is indicated.

Implications

Productivity is no longer a concern for manufacturing industries alone. The United States is moving toward a service-oriented economy. As we do so, the importance of productivity and the six other organizational performance criteria described in this study is becoming evident. Hospitals are unique among service industries in that they face the possibility of increasing governmental control over what they may charge for their services. Foodservice directors must know how their departments are performing in relation to other hospital dietary departments and other departments within their own hospitals in order to justify their existence to cost conscious administrators. All four resource groups (materials, labor, capital, and energy) must be considered in the evaluation of organizational performance--not just labor. Most of the literature available on productivity in foodservice deals with labor productivity only and generally begins from the standpoint of improvement. Productivity cannot be improved without first defining and measuring it.

This study is a first step. We must know what current knowledge and practices are before we can plan for standardization and improvement. The next step is to share the information collected with members of the profession to make them more aware and knowledgeable concerning the performance of their operations. Hopefully, this study has provoked some thought on organizational performance on the part of those who responded to it.

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APPENDIXES

APPENDIX A

PRODUCTIVITY MODEL

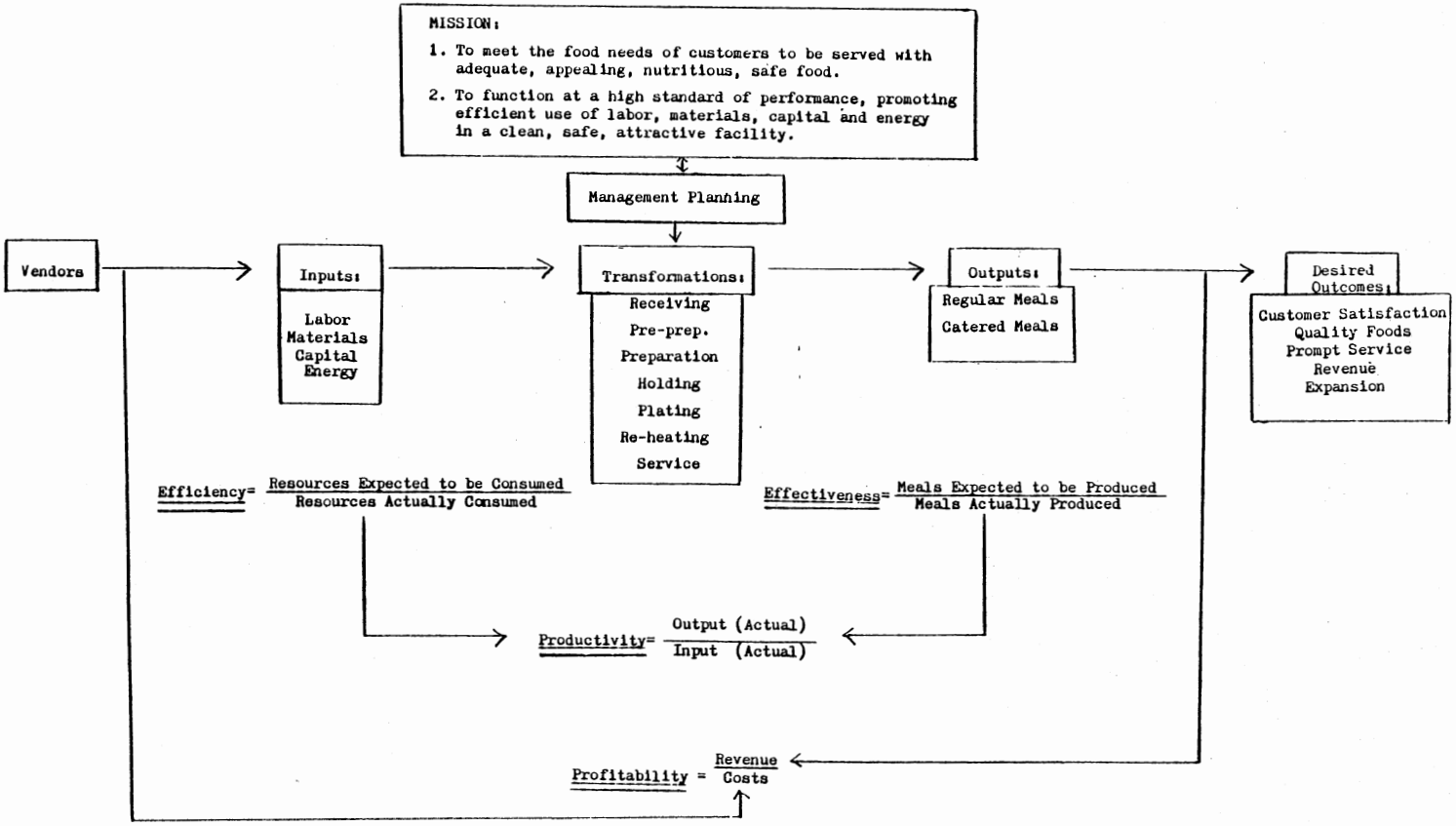

Figure 5. Productivity Model for a Hypothetical Foodservice Operation

APPENDIX B

PRELIMINARY STUDY QUESTIONNAIRE

N=12 Not all respondents answered all questions--some answered only part of a question.

FOODSERVICE PRODUCTIVITY STUDY

I. General Information

Directions: Please check or put an "X" by the appropriate answer.

1. Age group:
   - 4 (1) 20-29
   - 3 (2) 30-39
   - 2 (3) 40-49
   - 2 (4) 50-59
   - 1 (5) 60-69

2. Degrees attained: / Major emphasis:
   - _____ (1) High School Diploma / _____ (1)
   - 7 (2) B.S. / _____ (2)
   - 5 (3) M.S. / _____ (3)
   - _____ (4) Ph.D. / _____ (4)

3. Length of membership (in years) in Dietitians with Management Responsibilities in Healthcare Delivery Systems _____
   One nonmember Others--1,1,2,2,3,3,4,7 One misunderstood question (put 45 years)

4. Registration Status(R.D.)
   - 10 (1) Registered
   - 5 (3) Grandfather Clause
   - 3 (4) R.D. Exam
   - 1 (2) Non-registered

5. Route to ADA Membership:
   - 7 (1) Internship
   - 2 (2) Coordinated Undergraduate Program
   - 2 (3) Traineeship
   - 1 (4) M.S. + 6 months work experience
   - 1 (5) Other (please specify) Three years preplanned work experience

6. Position Title:
   - 6 (1) Director
   - 3 (2) Asst. Director
   - 1 (3) Administrative Dietitian
   - _____ (4) Generalist Dietitian
   - _____ (5) Consultant
   - 2 (6) Other (please specify) Chief, dietetic services Manager, patient services

7. Employment Status:
   - 12 (1) Full-time (35 hours or more per week)
   - _____ (2) Half-time or more but less than full-time
   - _____ (3) Less than half-time

8. Number of Years in Foodservice Management Positions:

4 (1) 1-5 years
5 (2) 5-10 years
1 (3) 10-15 years
2 (4) 15 or more years

9. Type of Hospital in which Employed:

3 (1) Federally owned
1 (2) Non-federal (state, county, city)
7 (3) Non-government, non-profit (church, other)
1 (4) Investor-owned, for profit (private, partnership, corporate)
_____ (5) Other (please specify) _____

10. Hospital size:

_____ (1) Fewer than 100 beds
1 (2) 100-299 beds
9 (3) 300-999 beds
2 (4) 1000 or more beds

11. Are your Foodservices Contracted to a Food or Management Company?

1 (1) Yes (please specify) Wood Enterprises
11 (2) No

12. Type of Foodservice System:

10 (1) Conventional - menu items prepared from basic ingredients on day they will be served and held in hot or cold state until served.
1 (2) Assembly/Serve - primarily commercially prepared foods purchased in ready-to-serve form.
1 (3) Cook/Chill - menu items prepared one or more days in advance and held in chilled state until served. (Wood Ent.)
_____ (4) Cook/Freeze - menu items prepared one or more days in advance and held in frozen state until served.

13. Do you have selective menus for patients? 10 (1) Yes
3 (2) No (VA hospitals)

14. By whom are new employees trained:

1 (1) Foodservice Director
4 (2) Training Director
3 (3) Assistant Director
9 (4) Supervisors
7 (5) Another employee
2 (6) Other Dietetic Assistant ~~Instructors~~

15. Length of training: _____ (1) 1-3 days
5 (2) 1-2 weeks
3 stated that it varied w/ the position 4 (3) 2 or more weeks

16. Who is in charge of purchasing in your operation?

4 (1) Foodservice Director
3 (2) Administrative Dietitian
2 (3) Purchasor (1 w/ R.D.)
1 (4) Supervisor
2 (5) Other (please specify) Production Manager ~~Asst. Director~~

17. Have you received any training in productivity measurement?

5 (1) Yes (please explain) Par-C inservice, workshops, Phila. Conf. ~~Educational seminars~~
7 (2) No

II. Performance Criteria

1. Productivity - is defined as the relationship of outputs to inputs, or reaching the highest level of performance with the least expenditure of resources.

a) How do you control inputs (resources used) in your operation? Example: following food and labor costs, capital expenditures, energy usage....

W/ detailed specifications (1)
By controlling labor carefully (8) (i.e. o.t. scheduling, sickness, tardiness)
By controlling food costs and waste (8)
Via monthly comparative statements on expenses (3)
By controlling capital expenditures (5)
Nutrient analysis (1)
Standardizing jobs and ingredients (1)
Meal cost allowance/conformance (1)
By controlling energy costs (1)
Via food cost monitors (1)

b) How do you control outputs (meals produced)? Example: via hospital financial records, average check....

Forecast sheets, census (4)
Standardized recipes (1)
Monthly financial records, reports (6)
Via a form developed by New Jersey Health Assn. (1)
Average check (1)
Routine diet control procedures (1)
Prices employees are willing to pay, patient & empl. selection (1) (??)
Financial records (1)
Count patient, cafeteria and catering meals (1)
Unit trend monitors (1) We don't charge for meals (1) (??)

c) Do you develop ratios and/or indexes by which to assess productivity? Examples:

$$\frac{\text{Meals produced}}{\text{Labor hours used}}$$ RATIO

$$\frac{\frac{\text{Meals produced, 1982}}{\text{Labor hours used, 1982}}}{\frac{\text{Meals produced, 1981}}{\text{Labor hours used, 1981}}}$$ INDEX

Please be very specific. (writing space at top of next page)

Yes - 6 No - 5

Meals/Man minutes (1)
Patient days/manhours worked (1)
Actual manminutes/actual rations served (2)--this is the VA standard method
(only non-professional employees counted, paid but not worked hours are subtracted out before calculating, different standards exist for different size hospitals)
Meals/labor hour used (1)
Meals/labor hours paid (2)
Paid labor hours/length of patient day (1)
FTE/task (1)
Meals/per capita food cost
Food cost %

2. Effectiveness - is defined as the degree of achievement of objectives. Example: Goal is to cut labor hours by 10% in the next quarter--labor records show that goal has been reached.

a) Do you set specific goals for your operation?

11 (1) Yes 1 (2) No

b) How is goal attainment evaluated?

Data collection, reports (2)
Documentation review (2)
By administrator (1)
Achievement of small, measurable goals (written in behavioral terms) (2)
Quarterly eval. meetings (2)
Personnel statistics, periodic review (1)

3. Quality - is defined as conformance to standards or specifications. Example: Meeting JCAH standards

a) Do you have quality standards which are specific to your operation?

11 (1) Yes 1 (2) No

If yes please tell by whom these standards are developed and list a few of them below.

By management (2)
Director, asst. director, clinical dietitian (1)
All dietitians and asst. director (1)
Asst. director (1)
Director & admin. dietitian (1)
QA coordinator (1)
Bureau staff (1) Wood Enterprises Op. Manual (1) (see attached for what they are)

b) Are employees aware of specific food and service standards in the operation? 11 (1) Yes 1 (2) No

If yes how are they made aware of these standards?

Meetings and inservice training (11)
Participation (i.e. taking temps.) (1)
Inspection reports (1)
QA audits (1)

c) Who is in charge of Quality Control in your operation:

8 (1) Director 5 (3) Supervisor
4 (2) Chef/Cook 6 (4) Other (please specify) Asst. director, Admin. dietitian, all dietitians, food scientist

(Most respondents listed a team consisting of director, dietitian and others)

d) Do you routinely survey customers (patients) concerning the quality of food and service? 11 (1) Yes 1 (2) No

If yes, how often? Cafeteria-daily, Catering-quarterly, weekly (1) Monthly (3), Quarterly (4), Twice yearly (1) ~~Yearly~~ 6 weeks (1)

e) What outside organizations govern quality standards in your operation? Example: JCAH, state/county health codes, parent company standards....

All mentioned JCAH, others mentioned were state, city, county, federal, hospital excellence program, quality of care commission, SERP, IG, parent company (wood enterprises).

4. Efficiency - is defined as $\frac{\text{resources expected to be consumed}}{\text{resources actually consumed}}$

Example: $\frac{\$ \text{ budgeted for food, 1982}}{\$ \text{ actually spent on food, 1982}}$

a) Do you keep records of labor, material, capital and energy resources used? 11 (1) Yes -- (2) No

If yes, which of these do you follow?

Labor, materials, capital	(6)
Materials, labor	(2)
All	(1)
Materials	(2)

b) Do you compare resources used with resource utilization targets?
9 (1) Yes 2 (2) No

c) What is the result if expenditures exceed budget? Example: price increases, budget increase for next period....

Balanced out in next few months (1) Budget increase (2)
Has never happened (1) Price increase (1) (Wood ent.)
Investigated, evaluated (3)
Negotiate w/ administration (2)
Request addn'l funds w/ justification (3)

5. Quality of Worklife - is defined as the affective responses of participants to working in a system. Example: job satisfaction, motivation, pay satisfaction....

a) Do you measure the quality of worklife in your operation?

5 (1) Yes 7 (2) No

If yes, how?

Meetings, attendance, cooperation, disciplinary action, lateness, participation in hospital functions, annual employee attitude survey, periodic study of problem areas, turnover, individual behavior (subjective) in-house transfers (each of these was mentioned once)

b) Have you ever used any of the following questionnaires in your operation: 12 no's

_____Job Diagnostic Survey (JDS)

_____Job Description Index (JDI)

_____Job Characteristics Inventory (JCI)

_____Brayfield Rothe Job Satisfaction Index

If yes, in what context was it used?

c) Do you link performance to rewards? If yes, how? Yes-5 No-4

Evaluation/raises - 3
Commendation letters - 1
Verbal recognition - 1
Merit pay for professional staff - 1
Performance awards - 4
Post complimentary notes from patients - 1

d) Do you use any form of participative management? Example: quality circles, incentive systems, suggestion systems.... Yes - 6 No - 4

Suggestion system (6)
Group meetings (4)
2A (??) (1)
Internal reviews (1)

6. Innovation - is defined as applied creativity in processes, methods, product, or technology. Example: use of a new food delivery system, installation of microwaves on floors, creation and use of new recipes, development of time-saving flow patterns for employees....

a) Do you promote innovation in your operation?

10 (1) Yes 2 (2) No

If yes, how? Brainstorming, suggestion system, using innovation is reward in itself, develop objectives to go beyond routine operations, creative problem solving, convenience entrees, employee input, remodeling for greater efficiency, upgrading trayline, consolidating tasks to eliminate duplication, portable steam cleaning equip, sensory evaluation, part. management.

b) What applications of new technology have taken place in your operation in the last year?

Computer, new menus and recipes, delivery system, layout renovation, new equipment, scheduling format, qa program, increased staff, new cash registers, patient hostess system, salads by the ounce, deli service, AltoSham oven, modified scramble layout in cafe., convenience foods, work-load configuration, word processor, Regethermic Food system, Mini-quick carousel trayline.

7. Profitability - is defined as the earned return on investment or the relationship of revenue to costs.

a) How do you measure profitability in your operation (if non-profit please state). Please give specific formulas.

Nonprofit - 10

One profit op. stated budget comparison (this was an investor owned)

One profit operatinn stated that they do not figure profitability of dietary

b) If non-profit are you held to a strict budget?

Yes - 7 Encouraged - 1

What are the results of exceeding that budget?

None in particular (1)
Never happened (3)
Investigated, adjusted (1)
Depends on cause (i.e. union demands etc.) (2)
Written justification (2)
Demerits (1)
Funds cut-off (1)

c) How do you determine meal prices?

Total food costs for pt services ÷ Patient days x 3
Food costs + 10-30%
NJHA sets them
1.5 x food costs (as per Monitrend reports)
Food cost + markup
Raw food costs + 50% for labor
Policy in past has been to recoup food cost, not labor--planning to change this in 84
Total food costs ÷ meal cost %
Food cost %
The VA respondents stated that they do not charge for meals

Comments concerning this study or any of your answers:

What does control mean?

Questionnaire not applicable to large hospital complex

Very interesting

Sorry answers are incomplete--didn't have much time at conference

- THANK YOU -

APPENDIX C

CORRESPONDENCE

Oklahoma State University

Department of Food, Nutrition and Institution Administration

STILLWATER, OKLAHOMA 74078
(405) 624-5039

September 5, 1983

Dear Colleague:

As management dietitians, you are well aware that the productivity of the foodservice industry has traditionally been only half that of the manufacturing industry. Perhaps this is due to the sporadic nature of our industry or to the lack of standardization of terminology and/or measurement practices. This study was undertaken to explore what measurement practices exist (or are on-going) in the foodservice departments of the health care industry. This is of critical importance to the industry since the first step toward improvement of productivity is measurement of productivity.

This phase of the study examines seven highly inter-related organizational performance criteria (productivity, profitability, quality, quality of worklife, effectiveness, efficiency and innovation). These criteria differ in importance from one establishment to the next. By better understanding the role each criteria plays in our industry, we can better understand the importance of productivity. We would like to know how you view these performance factors and how you evaluate each in your foodservice department. Will you please read the definitions for each criteria carefully and answer the questions with these definitions in mind. The answers from which you will select were generated from a pilot study conducted at the Productivity Conference sponsored by the practice group "ADA Members with Management Responsibilities in Health Care Delivery Systems," which was held in Philadelphia in June of 1983.

If you are not involved in the evaluation of organizational performance in the foodservice department of your hospital, will you please pass this survey on to the person who has this responsibility. The forms are coded for analysis only; results will not be identified with your institution at any time. After completing the questionnaire please fold, staple and return it to us. We would appreciate hearing from you by September 30, 1983. If you have any questions call us at (405) 624-5039.

Sincerely,

Kelli Shaw
Graduate Research Asst.

Lea Ebro, Ph.D., R.D.
Associate Professor

APPENDIX D

RESEARCH INSTRUMENT

FOODSERVICE PRODUCTIVITY STUDY

I. General Information

Directions: Please check or fill in the appropriate answers. It is important that you answer all the questions.

1. Age group:
   _____(1) 20-29
   _____(2) 30-39
   _____(3) 40-49
   _____(4) 50-59
   _____(5) 60-69

2. Degrees attained:
   _____(1) High School Diploma
   _____(2) B.S.
   _____(3) M.S.
   _____(4) Ph.D.

   Major Emphasis:
   (5) _____
   (6) _____
   (7) _____
   (8) _____

3. Registration Status (R.D.):
   _____(1) Registered
   _____(2) Grandfather Clause
   _____(3) Registration Exam
   _____(4) Non-registered

4. Route to ADA Membership:
   _____(1) Internship
   _____(2) CUP Program
   _____(3) Traineeship
   _____(4) Three year's pre-planned work experience
   _____(5) M.S. + 6 mos. work experience

5. Position Title:
   _____(1) Director
   _____(2) Asst. Director
   _____(3) Administrative Dietitian
   _____(4) Generalist Dietitian
   _____(5) Consultant
   _____(6) Other (please specify) _____

6. Number of years in foodservice management positions:
   _____(1) 1-5 years
   _____(2) 5-10 years
   _____(3) 10-15 years
   _____(4) 15 or more years

7. Type of hospital in which employed:
   _____(1) Federally owned
   _____(2) Non-federal (state, county, city)
   _____(3) Non-government, non-profit (church)
   _____(4) Investor-owned, for profit (private, partnership)
   _____(5) Other (please specify) _____

8. Hospital size:
   _____(1) Fewer than 100 beds
   _____(2) 100-299 beds
   _____(3) 300-999 beds
   _____(4) 1000 or more beds

9. Are your foodservices contracted to a foodservice management company?
   _____(1) Yes (please specify) _____
   _____(2) No

10. Type of foodservice system:
   _____(1) Conventional - menu items prepared from basic ingredients on day they will be served and held in hot or cold state until served.
   _____(2) Assembly/serve - primarily commercially prepared food purchased in ready-to-serve form.
   _____(3) Cook/chill - menu items prepared one or more days in advance and held in chilled state until served.
   _____(4) Cook/freeze - menu items prepared one or more days in advance and held in frozen state until served.

11. Have you received any training in productivity measurement?
   _____(1) Yes (please specify) _____
   _____(2) No

II. Performance Criteria

1. PRODUCTIVITY - is defined as the relationship of outputs to inputs, or reaching the highest level of performance with the least expenditure of resources.

Directions: Please circle the number which corresponds with the current procedures in your operation.

Which of the following do you use to control inputs?

Method	Always	Usually	Sometimes	Rarely	Never
(1) Detailed specifications when purchasing equipment and supplies	1	2	3	4	5
(2) Check (and appropriately adjust if necessary) labor usage at least quarterly	1	2	3	4	5
(3) "Comparison shop" for food and supplies	1	2	3	4	5
(4) Take advantage of seasonal food buys	1	2	3	4	5
(5) Use of standardized recipes	1	2	3	4	5
(6) Evaluate kitchen energy costs at least quarterly	1	2	3	4	5
(7) Monitor energy usage of specific pieces of equipment	1	2	3	4	5
(8) Routinely conduct physical inventory of storeroom	1	2	3	4	5
(9) Monitor breakage and pilferage of supplies	1	2	3	4	5
(10) Periodically review and revise job descriptions in order to prevent duplication of tasks	1	2	3	4	5
(11) Other (please specify) _____	1	2	3	4	5

Which of the following do you use to control outputs?

(12) Check daily census reports and plan production accordingly	1	2	3	4	5
(13) Keep production records for cafeteria and catering as well as for patient meal service	1	2	3	4	5
(14) Check production records at least quarterly to see that production is appropriate for demand in cafeteria	1	2	3	4	5
(15) Have a system for using left-over bulk foods from patient meal service	1	2	3	4	5
(16) Other (please specify) _____	1	2	3	4	5

Do you develop ratios and/or indexes by which to assess productivity?

$$\frac{\text{Meals produced}}{\text{Labor hours used}}$$

(RATIO)

_____ (17) Yes

$$\frac{\text{Meals produced, 1982}}{\text{Labor hours used, 1982}} \Big/ \frac{\text{Meals produced, 1981}}{\text{Labor hours used, 1981}}$$

(INDEX)

_____ (18) No

If yes, do you use any of the following ratios? (please check)

- [ ] (19) Meals/man-minutes
- [ ] (20) Patient days/hours worked
- [ ] (21) Meals/labor hours worked
- [ ] (22) Meals/labor hours paid
- [ ] (23) Rations served/actual man-minutes
- [ ] (24) FTE's/specific task
- [ ] (25) Meals/total food cost

If you use the inverse of any of these ratios (i.e. actual man-minutes per ration served) please specify which one.

2. EFFECTIVENESS - is defined as the degree of achievement of objectives. Example: Goal is to cut labor hours by 10% in the next quarter--labor records show that goal has been reached.

Do you set specific goals for your operation?

_____(1) Yes _____(2) No

Which of the following do you use to evaluate goal attainment? (please check)

- [ ] (3) Financial reports
- [ ] (4) Break goals into small measurable sub-goals
- [ ] (5) Evaluation meetings
- [ ] (6) Personnel statistical reports
- [ ] (7) Administration evaluates goal attainment

3. QUALITY - is defined as conformance to standards or specifications. Example: Meeting JCAH standards.

Do you have quality standards which are specific to your operation?

_____(1) Yes _____(2) No

By whom are these standards developed?

_____ (3) A management team
_____ (4) Director
_____ (5) Asst. Director
_____ (6) Administrative Dietitian
_____ (7) Quality assurance coordinator
_____ (8) Production manager
_____ (9) Foodservice management company
_____(10) Other (please specify) _____

Which of the following do you use to control quality in your operation?

- [ ] (11) Tray audits
- [ ] (12) Trayline check sheets
- [ ] (13) Temperature check of food in steamtable
- [ ] (14) Temperature check of food on ward
- [ ] (15) Periodic checks of food delivery time
- [ ] (16) Periodic survey of patients and customers as to quality of food and service
- [ ] (17) Regular (unannounced) sanitation inspections
- [ ] (18) Taste testing by management of new food items
- [ ] (19) Written standards for quality of food and service

Are quality standards discussed with employees at any time beyond their inservice training?

_____ (20) Yes _____ (21) No

Who is in charge of quality control in your operation?

_____ (22) A management team
_____ (23) Director
_____ (24) Asst. Director
_____ (25) Production manager
_____ (26) Food scientist
_____ (27) Other (please specify) _____

Which of the following organizations govern quality standards in your operation?

_____ (28) JCAH
_____ (29) State health codes
_____ (30) County health codes
_____ (31) City health codes
_____ (32) Contract company standards
_____ (33) Other (please specify) _____

4. EFFICIENCY - is defined as $\frac{\text{resourced expected to be consumed}}{\text{resources actually consumed}}$

Example: $\frac{\text{\$ budgeted for food, 1982}}{\text{\$ actually spent on food, 1982}}$

Of the following resources, on which do you keep records of the amounts used? (materials includes food and supplies)

☐ (1) Labor, materials, capital and energy
☐ (2) Labor, materials and capital
☐ (3) Labor, materials and energy
☐ (4) Materials and labor
☐ (5) Materials only
☐ (6) Other _____

Do you compare resources used with resource utilization targets?

_____ (7) Yes _____ (8) No

5. QUALITY OF WORKLIFE (QWL) - is defined as the affective responses of participants to working in a system.
Example: job satisfaction, motivation, pay satisfaction. . .

Do you measure the quality of worklife in your operation?

_____ (1) Yes _____ (2) No

Do you do or perform any of the following? (please check)

☐ (3) Use written job satisfaction questionnaires
☐ (4) Subjectively evaluate QWL by listening to employees
☐ (5) Subjectively evaluate QWL according to employee participation and cooperation
☐ (6) Monitor turnover, absenteeism, tardiness . . .

Do you link performance to rewards?

_____ (7) Yes _____ (8) No

Which of the following do you use? (please check)

☐ (9) Raises based upon performance appraisals
☐ (10) Commendation letters
☐ (11) Verbal recognition
☐ (12) Merit pay for management staff
☐ (13) Performance awards (non-monetary)
☐ (14) Performance awards (monetary)
☐ (15) A formal incentive system
☐ (16) Other _____

Do you use any of the following forms of participative management?

☐ (17) Suggestion system (If yes, please tell approximately how many suggestions have been accepted in the last year and what type of reward is given _____
☐ (18) Quality circles (or a variation thereof--please describe) _____
_____
☐ (19) Incentive system (please describe) _____
_____

6. INNOVATION - is defined as applied creativity in processes, methods, product or technology.

Which of the following do you use to promote innovation? (please check)

- [ ] (1) Brainstorming sessions
- [ ] (2) Active suggestion system
- [ ] (3) Employee participation at meetings
- [ ] (4) Reward employee input

Have you added any of the following in your operation within the last few years?

- [ ] (5) Computer, word processor
- [ ] (6) New menus and recipes
- [ ] (7) Layout changes
- [ ] (8) Revised job descriptions
- [ ] (9) New equipment (cooking, trayline etc.)
- [ ] (10) New scheduling procedures
- [ ] (11) New meal delivery service
- [ ] (12) Other (please specify)_____

7. PROFITABILITY - is defined as the earned return on investment or the relationship of revenue to costs.
If your operation is for profit, how do you measure profitability? (please give formulas)

Exceeding the budget in your department results in:

- [ ] (1) Has never happened
- [ ] (2) Nothing in particular
- [ ] (3) Investigation of causes and budget readjustment
- [ ] (4) Submission of written justification to administrators
- [ ] (5) Demerits
- [ ] (6) Cut-off of funds
- [ ] (7) Price increases

How do you determine meal prices?

- [ ] (8) Food cost + markup
- [ ] (9) Food + labor costs
- [ ] (10) Prices are state regulated
- [ ] (11) Do not charge for patient meals/ do not have cafeteria
- [ ] (12) Other_____

_____

_____

8. Please rate the seven performance criteria according to how much time you spend evaluating each of them in your operation. Rank (on a scale of 1 to 7), giving the criteria on which you spend the most time a "1" and so on to "7" which is the criteria on which you spend the least amount of time.

_____ Productivity
_____ Quality
_____ Innovation
_____ Effectiveness
_____ Efficiency
_____ Quality of Worklife
_____ Profitability

9. Please rate the seven performance criteria according to how important they are to the successful operation of your foodservice facility. Rank(on a scale of 1 to 7), giving the criteria which you feel is the most important a "1" and so on to "7" which is the criteria you feel is least important.

_____ Productivity
_____ Quality
_____ Innovation
_____ Effectiveness
_____ Efficiency
_____ Quality of Worklife
_____ Profitability

10. We welcome your comments on this study, the questionnaire, or the definitions used. Do you have alternative definitions for the performance criteria which you would prefer to see used?

THANK YOU FOR YOUR PARTICIPATION!

APPENDIX E

CHI SQUARE TABLES

TABLE OF EXP BY R8

EXP R8

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	31	24	55
	35.8	19.2	
	0.7	1.2	
	28.44	22.02	50.46
	56.36	43.64	
	43.66	63.16	
2	40	14	54
	35.2	18.8	
	0.7	1.2	
	36.70	12.84	49.54
	74.07	25.93	
	56.34	36.84	
TOTAL	71	38	109
	65.14	34.86	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	3.764	DF= 1	PROB=0.0524
PHI	-0.186		
CONTINGENCY COEFFICIENT	0.183		
CRAMER'S V	0.186		
LIKELIHOOD RATIO CHISQUARE	3.798	DF= 1	PROB=0.0513
CONTINUITY ADJ. CHI-SQUARE	3.024	DF= 1	PROB=0.0820
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0407
(2-TAIL)			PROB=0.0705

TABLE OF TRAIN BY R5

TRAIN R5

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	30	18	48
	25.1	22.9	
	1.0	1.0	
	27.52	16.51	44.04
	62.50	37.50	
	52.63	34.62	
2	27	34	61
	31.9	29.1	
	0.8	0.8	
	24.77	31.19	55.96
	44.26	55.74	
	47.37	65.38	
TOTAL	57	52	109
	52.29	47.71	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	3.581	DF= 1	PROB=0.0584
PHI	0.181		
CONTINGENCY COEFFICIENT	0.178		
CRAMER'S V	0.181		
LIKELIHOOD RATIO CHISQUARE	3.608	DF= 1	PROB=0.0575
CONTINUITY ADJ. CHI-SQUARE	2.888	DF= 1	PROB=0.0893
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0443
(2-TAIL)			PROB=0.0819

TABLE OF EXP BY R5

EXP	R5		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	23 28.8 1.2 21.10 41.82 40.35	32 26.2 1.3 29.36 58.18 61.54	55 50.46
2	34 28.2 1.2 31.19 62.96 59.65	20 25.8 1.3 18.35 37.04 38.46	54 49.54
TOTAL	57 52.29	52 47.71	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	4.883	DF= 1	PROB=0.0271
PHI	-0.212		
CONTINGENCY COEFFICIENT	0.207		
CRAMER'S V	0.212		
LIKELIHOOD RATIO CHISQUARE	4.921	DF= 1	PROB=0.0265
CONTINUITY ADJ. CHI-SQUARE	4.072	DF= 1	PROB=0.0436
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0215
(2-TAIL)			PROB=0.0352

TABLE OF SYS BY R3

SYS	R3		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	31 34.2 0.3 28.44 31.63 81.58	67 63.8 0.2 61.47 68.37 94.37	98 89.91
2	7 3.8 2.6 6.42 63.64 18.42	4 7.2 1.4 3.67 36.36 5.63	11 10.09
TOTAL	38 34.86	71 65.14	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	4.461	DF= 1	PROB=0.0347
PHI	-0.202		
CONTINGENCY COEFFICIENT	0.198		
CRAMER'S V	0.202		
LIKELIHOOD RATIO CHISQUARE	4.219	DF= 1	PROB=0.0400
CONTINUITY ADJ. CHI-SQUARE	3.163	DF= 1	PROB=0.0753
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0404
(2-TAIL)			PROB=0.0471

TABLE OF EXP BY R3

EXP	R3		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	13 19.2 2.0 11.93 23.64 34.21	42 35.8 1.1 38.53 76.36 59.15	55 50.46
2	25 18.8 2.0 22.94 46.30 65.79	29 35.2 1.1 26.61 53.70 40.85	54 49.54
TOTAL	38 34.86	71 65.14	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	6.161	DF= 1	PROB=0.0131
PHI	-0.238		
CONTINGENCY COEFFICIENT	0.231		
CRAMER'S V	0.238		
LIKELIHOOD RATIO CHISQUARE	6.240	DF= 1	PROB=0.0125
CONTINUITY ADJ. CHI-SQUARE	5.204	DF= 1	PROB=0.0225
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0110
(2-TAIL)			PROB=0.0162

TABLE OF TRAIN BY R3

TRAIN R3

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	22	26	48
	16.7	31.3	
	1.7	0.9	
	20.18	23.85	44.04
	45.83	54.17	
	57.89	36.62	
2	16	45	61
	21.3	39.7	
	1.3	0.7	
	14.68	41.28	55.96
	26.23	73.77	
	42.11	63.38	
TOTAL	38	71	109
	34.86	65.14	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	4.546	DF= 1	PROB=0.0330
PHI	0.204		
CONTINGENCY COEFFICIENT	0.200		
CRAMER'S V	0.204		
LIKELIHOOD RATIO CHISQUARE	4.544	DF= 1	PROB=0.0330
CONTINUITY ADJ. CHI-SQUARE	3.724	DF= 1	PROB=0.0536
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0269
(2-TAIL)			PROB=0.0432

SAS

TABLE OF SYS BY R2

SYS	R2		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	29 32.4 0.4 26.61 29.59 80.56	69 65.6 0.2 63.30 70.41 94.52	98 89.91
2	7 3.6 3.1 6.42 63.64 19.44	4 7.4 1.5 3.67 36.36 5.48	11 10.09
TOTAL	36 33.03	73 66.97	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	5.182	DF= 1	PROB=0.0228
PHI	-0.218		
CONTINGENCY COEFFICIENT	0.213		
CRAMER'S V	0.218		
LIKELIHOOD RATIO CHISQUARE	4.829	DF= 1	PROB=0.0280
CONTINUITY ADJ. CHI-SQUARE	3.757	DF= 1	PROB=0.0526
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0293
(2-TAIL)			PROB=0.0386

TABLE OF SYS BY R7

SYS	R7		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	12 14.4 0.4 11.01 12.24 75.00	86 83.6 0.1 78.90 87.76 92.47	98 89.91
2	4 1.6 3.5 3.67 36.36 25.00	7 9.4 0.6 6.42 63.64 7.53	11 10.09
TOTAL	16 14.68	93 85.32	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	4.594	DF= 1	PROB=0.0321
PHI	-0.205		
CONTINGENCY COEFFICIENT	0.201		
CRAMER'S V	0.205		
LIKELIHOOD RATIO CHISQUARE	3.639	DF= 1	PROB=0.0564
CONTINUITY ADJ. CHI-SQUARE	2.870	DF= 1	PROB=0.0903
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0548
(2-TAIL)			PROB=0.0548

TABLE OF SYS BY RG

SYS RG

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	6	92	98
	8.1	89.9	
	0.5	0.0	
	5.50	84.40	89.91
	6.12	93.88	
	66.67	92.00	
2	3	8	11
	0.9	10.1	
	4.8	0.4	
	2.75	7.34	10.09
	27.27	72.73	
	33.33	8.00	
TOTAL	9	100	109
	8.26	91.74	100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	5.840	DF= 1	PROB=0.0157
PHI	-0.231		
CONTINGENCY COEFFICIENT	0.226		
CRAMER'S V	0.231		
LIKELIHOOD RATIO CHISQUARE	4.095	DF= 1	PROB=0.0430
CONTINUITY ADJ. CHI-SQUARE	3.382	DF= 1	PROB=0.0659
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0464
(2-TAIL)			PROB=0.0464

TABLE OF TRAIN BY EFFEC1

TRAIN EFFEC1

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	47	1	48
	41.8	6.2	
	0.6	4.3	
	43.12	0.92	44.04
	97.92	2.08	
	49.47	7.14	
2	48	13	61
	53.2	7.8	
	0.5	3.4	
	44.04	11.93	55.96
	78.69	21.31	
	50.53	92.86	
TOTAL	95	14	109
	87.16	12.84	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	8.872	DF= 1	PROB=0.0029
PHI	0.285		
CONTINGENCY COEFFICIENT	0.274		
CRAMER'S V	0.285		
LIKELIHOOD RATIO CHISQUARE	10.660	DF= 1	PROB=0.0011
CONTINUITY ADJ. CHI-SQUARE	7.237	DF= 1	PROB=0.0071
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0021
(2-TAIL)			PROB=0.0030

TABLE OF TRAIN BY EFFEC3

TRAIN EFFEC3

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	26 21.1 1.1 23.85 54.17 54.17	22 26.9 0.9 20.18 45.83 36.07	48 44.04
2	22 26.9 0.9 20.18 36.07 45.83	39 34.1 0.7 35.78 63.93 63.93	61 55.96
TOTAL	48 44.04	61 55.96	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	3.571	DF= 1	PROB=0.0588
PHI	0.181		
CONTINGENCY COEFFICIENT	0.178		
CRAMER'S V	0.181		
LIKELIHOOD RATIO CHISQUARE	3.581	DF= 1	PROB=0.0585
CONTINUITY ADJ. CHI-SQUARE	2.875	DF= 1	PROB=0.0900
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0449
(2-TAIL)			PROB=0.0802

TABLE OF TRAIN BY EFFEC5

TRAIN EFFEC5

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	37	11	48
	26.9	21.1	
	3.8	4.9	
	33.94	10.09	44.04
	77.08	22.92	
	60.66	22.92	
2	24	37	61
	34.1	26.9	
	3.0	3.8	
	22.02	33.94	55.96
	39.34	60.66	
	39.34	77.08	
TOTAL	61	48	109
	55.96	44.04	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	15.524	DF= 1	PROB=0.0001
PHI	0.377		
CONTINGENCY COEFFICIENT	0.353		
CRAMER'S V	0.377		
LIKELIHOOD RATIO CHISQUARE	16.106	DF= 1	PROB=0.0001
CONTINUITY ADJ. CHI-SQUARE	14.031	DF= 1	PROB=0.0002
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0001
(2-TAIL)			PROB=0.0001

TABLE OF HOS BY EFFECA

HOS EFFECA

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
0	1 0.4 0.8 0.92 100.00 2.17	0 0.6 0.6 0.00 0.00 0.00	1 0.92
1	2 2.1 0.0 1.83 40.00 4.35	3 2.9 0.0 2.75 60.00 4.76	5 4.59
2	12 11.8 0.0 11.01 42.86 26.09	16 16.2 0.0 14.68 57.14 25.40	28 25.69
3	19 20.3 0.1 17.43 39.58 41.30	29 27.7 0.1 26.61 60.42 46.03	48 44.04
4	1 5.1 3.3 0.92 8.33 2.17	11 6.9 2.4 10.09 91.67 17.46	12 11.01
5	11 6.3 3.4 10.09 73.33 23.91	4 8.7 2.5 3.67 26.67 6.35	15 13.76
TOTAL	46 42.20	63 57.80	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	13.123	DF= 5	PROB=0.0223
PHI	0.347		
CONTINGENCY COEFFICIENT	0.328		
CRAMER'S V	0.347		
LIKELIHOOD RATIO CHISQUARE	14.746	DF= 5	PROB=0.0115

TABLE OF AGE BY QUA10

AGE / QUA10	1	2	TOTAL
1	42	13	55
	46.4	8.6	
	0.4	2.3	
	38.53	11.93	50.46
	76.36	23.64	
	45.65	76.47	
2	50	4	54
	45.6	8.4	
	0.4	2.3	
	45.87	3.67	49.54
	92.59	7.41	
	54.35	23.53	
TOTAL	92	17	109
	84.40	15.60	100.00

FREQUENCY
EXPECTED
CELL CHI2
PERCENT
ROW PCT
COL PCT

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	5.452	DF= 1	PROB=0.0195
PHI	-0.224		
CONTINGENCY COEFFICIENT	0.218		
CRAMER'S V	0.224		
LIKELIHOOD RATIO CHISQUARE	5.704	DF= 1	PROB=0.0169
CONTINUITY ADJ. CHI-SQUARE	4.289	DF= 1	PROB=0.0384
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0179
(2-TAIL)			PROB=0.0326

TABLE OF EXP BY QUA10

EXP / QUA10	1	2	TOTAL
1	41	14	55
	46.4	8.6	
	0.6	3.4	
	37.61	12.84	50.46
	74.55	25.45	
	44.57	82.35	
2	51	3	54
	45.6	8.4	
	0.6	3.5	
	46.79	2.75	49.54
	94.44	5.56	
	55.43	17.65	
TOTAL	92	17	109
	84.40	15.60	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	8.196	DF= 1	PROB=0.0042
PHI	-0.274		
CONTINGENCY COEFFICIENT	0.264		
CRAMER'S V	0.274		
LIKELIHOOD RATIO CHISQUARE	8.803	DF= 1	PROB=0.0030
CONTINUITY ADJ. CHI-SQUARE	6.754	DF= 1	PROB=0.0094
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0039
(2-TAIL)			PROB=0.0069

TABLE OF SIZE BY QUA1O

SIZE	QUA1O		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	39	12	51
	43.0	8.0	
	0.4	2.1	
	35.78	11.01	46.79
	76.47	23.53	
	42.39	70.59	
2	53	5	58
	49.0	9.0	
	0.3	1.8	
	48.62	4.59	53.21
	91.38	8.62	
	57.61	29.41	
TOTAL	92	17	109
	84.40	15.60	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	4.582	DF= 1	PROB=0.0323
PHI	-0.205		
CONTINGENCY COEFFICIENT	0.201		
CRAMER'S V	0.205		
LIKELIHOOD RATIO CHISQUARE	4.659	DF= 1	PROB=0.0309
CONTINUITY ADJ. CHI-SQUARE	3.520	DF= 1	PROB=0.0606
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0299
(2-TAIL)			PROB=0.037[illegible]

TABLE OF HOS BY QUA13

HOS QUA13

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
0	0 0.8 0.8 0.00 0.00 0.00	1 0.2 2.6 0.92 100.00 4.00	1 0.92
1	5 3.9 0.3 4.59 100.00 5.95	0 1.1 1.1 0.00 0.00 0.00	5 4.59
2	22 21.6 0.0 20.18 78.57 26.19	6 6.4 0.0 5.50 21.43 24.00	28 25.69
3	40 37.0 0.2 36.70 83.33 47.62	8 11.0 0.8 7.34 16.67 32.00	48 44.04
4	6 9.2 1.1 5.50 50.00 7.14	6 2.8 3.8 5.50 50.00 24.00	12 11.01
5	11 11.6 0.0 10.09 73.33 13.10	4 3.4 0.1 3.67 26.67 16.00	15 13.76
TOTAL	84 77.06	25 22.94	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	11.042	DF= 5	PROB=0.0505
PHI	0.318		
CONTINGENCY COEFFICIENT	0.303		
CRAMER'S V	0.318		
LIKELIHOOD RATIO CHISQUARE	11.009	DF= 5	PROB=0.0512

TABLE OF HOS BY QUA14

HOS	QUA14		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
0	1 0.8 0.1 0.92 100.00 1.16	0 0.2 0.2 0.00 0.00 0.00	1 0.92
1	5 3.9 0.3 4.59 100.00 5.81	0 1.1 1.1 0.00 0.00 0.00	5 4.59
2	18 22.1 0.8 16.51 64.29 20.93	10 5.9 2.8 9.17 35.71 43.48	28 25.69
3	42 37.9 0.5 38.53 87.50 48.84	6 10.1 1.7 5.50 12.50 26.09	48 44.04
4	7 9.5 0.6 6.42 58.33 8.14	5 2.5 2.4 4.59 41.67 21.74	12 11.01
5	13 11.8 0.1 11.93 86.67 15.12	2 3.2 0.4 1.83 13.33 8.70	15 13.76
TOTAL	86 78.90	23 21.10	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	10.921	DF=	5	PROB=0.0530
PHI	0.317			
CONTINGENCY COEFFICIENT	0.302			
CRAMER'S V	0.317			
LIKELIHOOD RATIO CHISQUARE	11.584	DF=	5	PROB=0.0410

TABLE OF EXP BY QUA13

EXP QUA13

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	37 42.4 0.7 33.94 67.27 44.05	18 12.6 2.3 16.51 32.73 72.00	55 50.46
2	47 41.6 0.7 43.12 87.04 55.95	7 12.4 2.3 6.42 12.96 28.00	54 49.54
TOTAL	84 77.06	25 22.94	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	6.022	DF= 1	PROB=0.0141
PHI	-0.235		
CONTINGENCY COEFFICIENT	0.229		
CRAMER'S V	0.235		
LIKELIHOOD RATIO CHISQUARE	6.194	DF= 1	PROB=0.0128
CONTINUITY ADJ. CHI-SQUARE	4.956	DF= 1	PROB=0.0260
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0123
(2-TAIL)			PROB=0.0217

TABLE OF EXP BY QUA14

EXP	QUA14		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	39 43.4 0.4 35.78 70.91 45.35	16 11.6 1.7 14.68 29.09 69.57	55 50.46
2	47 42.6 0.5 43.12 87.04 54.65	7 11.4 1.7 6.42 12.96 30.43	54 49.54
TOTAL	86 78.90	23 21.10	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	4.257	DF= 1	PROB=0.0391
PHI	-0.198		
CONTINGENCY COEFFICIENT	0.194		
CRAMER'S V	0.198		
LIKELIHOOD RATIO CHISQUARE	4.354	DF= 1	PROB=0.0369
CONTINUITY ADJ. CHI-SQUARE	3.343	DF= 1	PROB=0.0675
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0329
(2 TAIL)			PROB=0.0502

TABLE OF AGE BY QUA14

AGE	QUA14		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	40 43.4 0.3 36.70 72.73 46.51	15 11.6 1.0 13.76 27.27 65.22	55 50.46
2	46 42.6 0.3 42.20 85.19 53.49	8 11.4 1.0 7.34 14.81 34.78	54 49.54
TOTAL	86 78.90	23 21.10	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	2.540	DF= 1	PROB=0.1110
PHI	-0.153		
CONTINGENCY COEFFICIENT	0.151		
CRAMER'S V	0.153		
LIKELIHOOD RATIO CHISQUARE	2.574	DF= 1	PROB=0.1086
CONTINUITY ADJ. CHI-SQUARE	1.847	DF= 1	PROB=0.1741
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0866
(2-TAIL)			PROB=0.1586

SAS

TABLE OF TRAIN BY QUA15

TRAIN	QUA15		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	47 43.2 0.3 43.12 97.92 47.96	1 4.8 3.1 0.92 2.08 9.09	48 44.04
2	51 54.8 0.3 46.79 83.61 52.04	10 6.2 2.4 9.17 16.39 90.91	61 55.96
TOTAL	98 89.91	11 10.09	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	6.063	DF= 1	PROB=0.013
PHI	0.236		
CONTINGENCY COEFFICIENT	0.230		
CRAMER'S V	0.236		
LIKELIHOOD RATIO CHISQUARE	7.156	DF= 1	PROB=0.007
CONTINUITY ADJ. CHI-SQUARE	4.588	DF= 1	PROB=0.032
FISHER'S EXACT TEST (1-TAIL)			PROB=0.01
(2-TAIL)			PROB=0.02

TABLE OF EXP BY QUA16

EXP	QUA16		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	41 44.9 0.3 37.61 74.55 46.07	14 10.1 1.5 12.84 25.45 70.00	55 50.46
2	48 44.1 0.3 44.04 88.89 53.93	6 9.9 1.5 5.50 11.11 30.00	54 49.54
TOTAL	89 81.65	20 18.35	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	3.742	DF= 1	PROB=0.0531
PHI	-0.185		
CONTINGENCY COEFFICIENT	0.182		
CRAMER'S V	0.185		
LIKELIHOOD RATIO CHISQUARE	3.833	DF= 1	PROB=0.0502
CONTINUITY ADJ. CHI-SQUARE	2.846	DF= 1	PROB=0.0916
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0449
(2-TAIL)			PROB=0.0816

TABLE OF HOS BY EFFIC1

HOS	EFFIC1		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
	0	1	.
1	2 0.6 3.2 1.85 40.00 15.38	3 4.4 0.4 2.78 60.00 3.16	5 4.63
2	2 3.4 0.6 1.85 7.14 15.38	26 24.6 0.1 24.07 92.86 27.37	28 25.93
3	2 5.8 2.5 1.85 4.17 15.38	46 42.2 0.3 42.59 95.83 48.42	48 44.44
4	1 1.4 0.1 0.93 8.33 7.69	11 10.6 0.0 10.19 91.67 11.58	12 11.11
5	6 1.8 9.7 5.56 40.00 46.15	9 13.2 1.3 8.33 60.00 9.47	15 13.89
TOTAL	13 12.04	95 87.96	108 100.00

STATISTICS FOR 2-WAY TABLES

WARNING OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	18.367	DF= 4	PROB=0.0010
PHI	0.412		
CONTINGENCY COEFFICIENT	0.381		
CRAMER'S V	0.412		
LIKELIHOOD RATIO CHISQUARE	14.573	DF= 4	PROB=0.0057

TABLE OF CONTR BY EFFIC3

CONTR	EFFIC3		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
.	0	1	.
1	1 0.1 7.1 0.93 8.33 100.00	11 11.9 0.1 10.19 91.67 10.28	12 11.11
2	0 0.9 0.9 0.00 0.00 0.00	96 95.1 0.0 88.89 100.00 89.72	96 88.89
TOTAL	1 0.93	107 99.07	108 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	8.075	DF=	1	PROB=0.0045
PHI	0.273			
CONTINGENCY COEFFICIENT	0.264			
CRAMER'S V	0.273			
LIKELIHOOD RATIO CHISQUARE	4.471	DF=	1	PROB=0.0345
CONTINUITY ADJ. CHI-SQUARE	1.546	DF=	1	PROB=0.2138
FISHER'S EXACT TEST (1-TAIL)				PROB=0.1111
(2-TAIL)				PROB=0.1111

TABLE OF SYS BY EFFIC3

SYS	EFFIC3		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	0 0.9 0.9 0.00 0.00 0.00	98 97.1 0.0 89.91 100.00 90.74	98 89.91
2	1 0.1 8.0 0.92 9.09 100.00	10 10.9 0.1 9.17 90.91 9.26	11 10.09
TOTAL	1 0.92	108 99.08	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	8.992	DF= 1	PROB=0.0027
PHI	-0.287		
CONTINGENCY COEFFICIENT	0.276		
CRAMER'S V	0.287		
LIKELIHOOD RATIO CHISQUARE	4.671	DF= 1	PROB=0.0307
CONTINUITY ADJ. CHI-SQUARE	1.772	DF= 1	PROB=0.1832
FISHER'S EXACT TEST (1-TAIL)			PROB=0.1005
(2-TAIL)			PROB=0.1005

TABLE OF AGE BY EFFIC4

AGE	EFFIC4		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	8 12.1 1.4 7.34 14.55 33.33	47 42.9 0.4 43.12 85.45 55.29	55 50.46
2	16 11.9 1.4 14.68 29.63 66.67	38 42.1 0.4 34.86 70.37 44.71	54 49.54
TOTAL	24 22.02	85 77.98	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	3.611	DF= 1	PROB=0.0574
PHI	-0.182		
CONTINGENCY COEFFICIENT	0.179		
CRAMER'S V	0.182		
LIKELIHOOD RATIO CHISQUARE	3.664	DF= 1	PROB=0.0556
CONTINUITY ADJ. CHI-SQUARE	2.786	DF= 1	PROB=0.0951
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0470
(2-TAIL)			PROB=0.0674

TABLE OF EXP BY EFFIC4

EXP	EFFIC4		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	5 12.1 4.2 4.59 9.09 20.83	50 42.9 1.2 45.87 90.91 58.82	55 50.46
2	19 11.9 4.3 17.43 35.19 79.17	35 42.1 1.2 32.11 64.81 41.18	54 49.54
TOTAL	24 22.02	85 77.98	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	10.805	DF= 1	PROB=0.0010
PHI	0.315		
CONTINGENCY COEFFICIENT	0.300		
CRAMER'S V	0.315		
LIKELIHOOD RATIO CHISQUARE	11.359	DF= 1	PROB=0.0008
CONTINUITY ADJ. CHI-SQUARE	9.339	DF= 1	PROB=0.0022
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0009
(2-TAIL)			PROB=0.0011

SAS

TABLE OF SYS BY EFFIC4

SYS	EFFIC4		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	19 21.6 0.3 17.43 19.39 79.17	79 76.4 0.1 72.48 80.61 92.94	98 89.91
2	5 2.4 2.7 4.59 45.45 20.83	6 8.6 0.8 5.50 54.55 7.06	11 10.09
TOTAL	24 22.02	85 77.98	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	3.914	DF= 1	PROB=0.0479
PHI	0.189		
CONTINGENCY COEFFICIENT	0.186		
CRAMER'S V	0.189		
LIKELIHOOD RATIO CHISQUARE	3.366	DF= 1	PROB=0.0665
CONTINUITY ADJ. CHI SQUARE	2.543	DF= 1	PROB=0.1106
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0620
(2-TAIL)			PROB=0.0620

TABLE OF TRAIN BY EFFIC4

TRAIN	EFFIC4		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	15 10.6 1.9 13.76 31.25 62.50	33 37.4 0.5 30.28 68.75 38.82	48 44.04
2	9 13.4 1.5 8.26 14.75 37.50	52 47.6 0.4 47.71 85.25 61.18	61 55.96
TOTAL	24 22.02	85 77.98	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI SQUARE	4.257	DF= 1	PROB=0.0391
PHI	0.198		
CONTINGENCY COEFFICIENT	0.194		
CRAMER'S V	0.198		
LIKELIHOOD RATIO CHISQUARE	4.245	DF= 1	PROB=0.0394
CONTINUITY ADJ. CHI-SQUARE	3.351	DF= 1	PROB=0.0672
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0338
(2-TAIL)			PROB=0.0612

TABLE OF AGE BY QWL4

AGE	QWL4		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	27 32.8 1.0 24.77 49.09 41.54	28 22.2 1.5 25.69 50.91 63.64	55 50.46
2	38 32.2 1.0 34.86 70.37 58.46	16 21.8 1.5 14.68 29.63 36.36	54 49.54
TOTAL	65 59.63	44 40.37	109 100.00

STATISTICS FOR 2-WAY TABLES

HI SQUARE	5.126	DF= 1	PROB=0.0236
PHI	0.217		
CONTINGENCY COEFFICIENT	0.212		
CRAMER'S V	0.217		
LIKELIHOOD RATIO CHISQUARE	5.176	DF= 1	PROB=0.0229
CONTINUITY ADJ. CHI-SQUARE	4.280	DF= 1	PROB=0.0386
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0190
(2-TAIL)			PROB=0.0317

TABLE OF SIZE BY QWL1

SIZE QWL1

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	0	1	2	TOTAL
1	1	39	11	51
	0.5	34.2	16.4	
	0.6	0.7	1.8	
	0.92	35.78	10.09	46.79
	1.96	76.47	21.57	
	100.00	53.42	31.43	
2	0	34	24	58
	0.5	38.8	18.6	
	0.5	0.6	1.6	
	0.00	31.19	22.02	53.21
	0.00	58.62	41.38	
	0.00	46.58	68.57	
TOTAL	1	73	35	109
	0.92	66.97	32.11	100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	5.745	DF= 2	PROB=0.0566
PHI	0.230		
CONTINGENCY COEFFICIENT	0.224		
CRAMER'S V	0.230		
LIKELIHOOD RATIO CHISQUARE	6.225	DF= 2	PROB=0.0445

TABLE OF TRAIN BY QWL2

TRAIN QWL2

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	0	1	2	TOTAL
1	1 0.4 0.7 0.92 2.08 100.00	13 7.9 3.2 11.93 27.08 72.22	34 39.6 0.8 31.19 70.83 37.78	48 44.04
2	0 0.6 0.6 0.00 0.00 0.00	5 10.1 2.6 4.59 8.20 27.78	56 50.4 0.6 51.38 91.80 62.22	61 55.96
TOTAL	1 0.92	18 16.51	90 82.57	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING: OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	8.564	DF = 2	PROB=0.014
PHI	0.279		
CONTINGENCY COEFFICIENT	0.269		
CRAMER'S V	0.279		
LIKELIHOOD RATIO CHISQUARE	8.948	DF = 2	PROB=0.011

TABLE OF EXP BY QWL8

EXP	QWL8		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	15 21.2 1.8 13.76 27.27 35.71	40 33.8 1.1 36.70 72.73 59.70	55 50.46
2	27 20.8 1.8 24.77 50.00 64.29	27 33.2 1.2 24.77 50.00 40.30	54 49.54
TOTAL	42 38.53	67 61.47	109 100.00

STATISTICS FOR 2 WAY TABLES

CHI SQUARE	5.942	DF= 1	PROB=0.0148
PHI	-0.233		
CONTINGENCY COEFFICIENT	0.227		
CRAMER'S V	0.233		
LIKELIHOOD RATIO CHISQUARE	6.006	DF= 1	PROB=0.0143
CONTINUITY ADJ. CHI SQUARE	5.021	DF= 1	PROB=0.0250
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0123
(2-TAIL)			PROB=0.0185

TABLE OF TRAIN BY INN1

TRAIN	INN1		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	37 29.1 2.2 33.94 77.08 56.06	11 18.9 3.3 10.09 22.92 25.58	48 44.04
2	29 36.9 1.7 26.61 47.54 43.94	32 24.1 2.6 29.36 52.46 74.42	61 55.96
TOTAL	66 60.55	43 39.45	109 100.00

STATISTICS FOR 2 WAY TABLES

CHI-SQUARE	9.815	DF = 1	PROB=0.00[illegible]
PHI	0.300		
CONTINGENCY COEFFICIENT	0.287		
CRAMER'S V	0.300		
LIKELIHOOD RATIO CHISQUARE	10.126	DF = 1	PROB=0.00[illegible]
CONTINUITY ADJ. CHI-SQUARE	8.617	DF = 1	PROB=0.00[illegible]
FISHER'S EXACT TEST (1-TAIL)			PROB=0.00[illegible]
(2-TAIL)			PROB=0.00[illegible]

TABLE OF SIZE BY INN5

SIZE	INN5		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	10 15.9 2.2 9.17 19.61 29.41	41 35.1 1.0 37.61 80.39 54.67	51 46.79
2	24 18.1 1.9 22.02 41.38 70.59	34 39.9 0.9 31.19 58.62 45.33	58 53.21
TOTAL	34 31.19	75 68.81	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	5.993	DF= 1	PROB=0.0144
PHI	-0.234		
CONTINGENCY COEFFICIENT	0.228		
CRAMER'S V	0.234		
LIKELIHOOD RATIO CHISQUARE	6.144	DF= 1	PROB=0.0132
CONTINUITY ADJ. CHI-SQUARE	5.022	DF= 1	PROB=0.0250
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0119
(2-TAIL)			PROB=0.0239

TABLE OF SIZE BY INN11

SIZE	INN11		
FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	1	2	TOTAL
1	14 19.2 1.4 12.84 27.45 34.15	37 31.8 0.8 33.94 72.55 54.41	51 46.79
2	27 21.8 1.2 24.77 46.55 65.85	31 36.2 0.7 28.44 53.45 45.59	58 53.21
TOTAL	41 37.61	68 62.39	109 100.00

STATISTICS FOR 2-WAY TABLES

CHI SQUARE	4.219	DF= 1	PROB=0.0400
PHI	-0.197		
CONTINGENCY COEFFICIENT	0.193		
CRAMER'S V	0.197		
LIKELIHOOD RATIO CHISQUARE	4.274	DF= 1	PROB=0.0387
CONTINUITY ADJ. CHI-SQUARE	3.445	DF= 1	PROB=0.0635
FISHER'S EXACT TEST (1 TAIL)			PROB=0.0312
(2 TAIL)			PROB=0.0487

TABLE OF SIZE BY PROF1

SIZE PROF1

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	.	1	2	TOTAL
1	0	13	38	51
	.	8.5	42.5	
	.	2.4	0.5	
	.	12.04	35.19	47.22
	.	25.49	74.51	
	.	72.22	42.22	
2	1	5	52	57
	.	9.5	47.5	
	.	2.1	0.4	
	.	4.63	48.15	52.78
	.	8.77	91.23	
	.	27.78	57.78	
TOTAL		18	90	108
		16.67	83.33	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	5.417	DF= 1	PROB=0.0199
PHI	0.224		
CONTINGENCY COEFFICIENT	0.219		
CRAMER'S V	0.224		
LIKELIHOOD RATIO CHISQUARE	5.536	DF= 1	PROB=0.0186
CONTINUITY ADJ. CHI-SQUARE	4.280	DF= 1	PROB=0.0386
FISHER'S EXACT TEST (1-TAIL)			PROB=0.0187
(2-TAIL)			PROB=0.036.1

TABLE OF HOS BY PROF11

HOS PROF11

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	0	1	2	TOTAL
0	0 0.0 0.0 0.00 0.00 0.00	0 0.1 0.1 0.00 0.00 0.00	1 0.9 0.0 0.92 100.00 1.03	1 0.92
1	0 0.0 0.0 0.00 0.00 0.00	3 0.5 12.3 2.75 60.00 27.27	2 4.4 1.3 1.83 40.00 2.06	5 4.59
2	0 0.3 0.3 0.00 0.00 0.00	1 2.8 1.2 0.92 3.57 9.09	27 24.9 0.2 24.77 96.43 27.84	28 25.69
3	1 0.4 0.7 0.92 2.08 100.00	0 4.8 4.8 0.00 0.00 0.00	47 42.7 0.4 43.12 97.92 48.45	48 44.04
4	0 0.1 0.1 0.00 0.00 0.00	4 1.2 6.4 3.67 33.33 36.36	8 10.7 0.7 7.34 66.67 8.25	12 11.01
5	0 0.1 0.1 0.00 0.00 0.00	3 1.5 1.5 2.75 20.00 27.27	12 13.3 0.1 11.01 80.00 12.37	15 13.76
TOTAL	1 0.92	11 10.09	97 88.99	109 100.00

STATISTICS FOR 2-WAY TABLES

WARNING OVER 20% OF THE CELLS HAVE EXPECTED COUNTS LESS THAN 5.
TABLE IS SO SPARSE THAT CHI-SQUARE MAY NOT BE A VALID TEST.

CHI-SQUARE	30.393	DF= 10	PROB=0.0007
PHI	0.528		
CONTINGENCY COEFFICIENT	0.467		
CRAMER'S V	0.373		
LIKELIHOOD RATIO CHISQUARE	27.098	DF= 10	PROB=0.0025

VITA 2

Kelli Kinsella Shaw

Candidate for the Degree of

Master of Science

Thesis: MEASURING PRODUCTIVITY AND SIX OTHER INTERRELATED ORGANIZATIONAL PERFORMANCE CRITERIA IN HEALTH CARE DELIVERY SYSTEMS

Major Field: Food, Nutrition and Institution Administration

Biographical:

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