DECISION MAKING STRATEGY IN THE SELECTION OF COOK-CHILL PRODUCTION IN HOSPITAL FOODSERVICES

by

Claudia Gill Green

Dissertation submitted to the Graduate Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Human Nutrition and Foods

Approved:

Dr. Mahmood Khan, Chairman

Dr. Ralph Badinelli

Dr. Suzanne Murrmann

Dr. Merle Pierson

Dr. Eliza Tse

Dr. Lucille Wakefield

ACKNOWLEDGEMENTS

The researcher wishes to thank those many individuals who provided encouragement and support in the completion of the dissertation. Special thanks go to her family and friends for their support.

Sincere thanks goes to her major professor and chairperson of her advisory committee, Dr. Mahmood Khan, whose patience and guidance have been an integral part of successful completion of the Ph.D. Recognition to Dr. Ralph Badinelli of the Pamplin School fo Business who challenged and encouraged her to completion of this research.

Sincere appreciation to the members of the Delphi panel who participated in this project. Their perserverence through three long questionnaires warrants recognition. Many thanks to Amelia Catakis of Marriott Hotels for providing gift certificates as incentives to the Delphi panel.

Thanks to Bea Martin, Sharon Cecil, and Chris Patrick of the administrative office of the Department of Hotel, Restaurant, and Institution Managment who made it possible to complete this research long distance.

Grateful recognition goes to three very special mentors who supported the graduate school effort and provided encouragement throughout, Dr. Lucille Wakefield, Dr. Sheron Sumner, and Mrs. Mary Dickey.

Finally, appreciation to Steve Hundley for many, many hours of late night proofing and coffee breaks.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Background

During the past decade healthcare has been dramatically affected by changes in the economy, in hospital reimbursement policies, and the delivery of healthcare services. The decline in hospital admissions, the increase in outpatient services, and the increase in hospital mergers have changed the nature of hospital operations including foodservices (American Hospital Association, 1990). In this environment, hospitals can no longer rely on federal reimbursements to keep them solvent, nor can hospitals use their non-profit status to excise themselves from the responsibility of operating a profitable entity (Crimmins, 1982).

Changes in the nature of the environment of hospitals has made it necessary for emergency rooms, intensive care units, outpatient clinics, as well as foodservice departments to become responsible for their own financial solvency . Delegation of the responsibility for solvency to subsidiaries within the hospital organization reduces the overall financial risk by reducing the reliance on the federal government for the solvency of the hospital (Crimmins, 1982).

Over the period of 1987 to 1991 (Table 1), the increase in income of hospital foodservices from 9.5 to 11.4 billion dollars (Restaurants and Institutions, 1990) has been accompanied by an increase in competition from multi-hospital systems (Rose, 1986). The competitive environment has made it necessary for foodservice administrators in independent hospitals to increase the profitability of their operations (Schulz and Johnson, 1983; Schuster, 1982; Rose, 1986) through examining and adopting alternative and less costly methods of operation (Goldsmith, 1980).

TABLE 1

Institutional Foodservice Sales by Segment
(in $ billions)

Segment	1987	1988	1989	1990	1991
Business & Industry	13.8	14.6	15.4	16.2	17.3
School Foodservice (primary/secondary)	11.3	11.9	12.6	13.3	14.1
College/University	6.4	6.7	6.9	7.3	7.7
Daycare/Childcare	2.0	2.1	2.3	2.4	2.6
Hospitals	9.5	9.9	10.3	10.8	11.4
Nursing Homes/Elder Care/ Life Care	3.9	3.4	4. 5	4.8	5.1
Military	4.9	5.1	5.3	5.6	5.9
Other	1.8	1.9	2.0	2.2	2.3
TOTAL INSTITUTIONAL	56.3	59.2	62.4	65.9	69.8
TOTAL FOODSERVICE	200.5	215.0	227.0	240.7	256.4

Note. From "1991 Foodservice Forecast" by Bureau of Foodservice Research, A Research Affiliate of Restaurants and Institutions Magazine. November, 1990. Copyright by Cahners Publications.

According to the American Productivity Center, productivity in manufacturing as well as service industries in the U.S. has declined since World War II. Although the declining productivity has been called a national challenge for manufacturing and service businesses (Coffey, 1972), the National Restaurant Association has estimated that foodservice operations are approximately half as efficient as manufacturing operations (Mill, 1989).

Productivity of hospital foodservices has been a concern since the mid 1950s. Numerous researchers have examined, identified, and suggested methods by which to increase productivity in hospital foodservices (Tuthill, 1956; Kent, 1965; Matthews, 1975; Donaldson, 1971; Ruf and Donaldson, 1975; Bryan, 1976; Ellis, 1976; Schuster, 1980; Rose, 1980; Matthews, 1982a & b). In 1975 Ruf and Donaldson forecasted that productivity, in terms of quality and quantity of output, would be one of the top priorities of hospital foodservice directors in the future. They suggested that changes in the market forms of foods and changes in the food production equipment would be factors that would help increase productivity.

Since productivity, which is based on inputs and outputs, is associated with revenue, profits, and growth (Coffey, 1972), hospital foodservice administrators in today's health care environment are taking a more critical look at it. Administrators who are being challenged to increase profitability, may examine the various levels of productivity of the four basic foodservice production systems (Figure 1) : conventional, convenience, cook-freeze, and cook-chill (Unklesbay, Maxcy, Knickreham, Stevenson, Cremer, and Matthews, 1977). The conventional foodservice, which involves on-site preparation from fresh ingredients for service the same day, is by nature labor intensive (Donaldson, 1971; Rinke, 1976). Convenience foodservice involves the purchase and use of foods that have been totally or partially prepared and need to be reheated prior to serving. Ready pre-

Conventional	Convenience	Cook-freeze	Cook-chill
		(Ready food processes)	
Receiving	Receiving	Receiving	Receiving
Storage	Storage	Storage	Storage
Production		Production	Production
	Rethermalize	Blast-freeze	Blast-chill or Tumble-chill
		Storage	Storage
Meal assembly	Meal assembly	Meal assembly	Meal assembly
		Rethermalize	Rethermalize
Meal service	Meal service	Meal service	Meal service

FIGURE 1 Comparison of Four Food Production Processes

pared food systems which include both cook-freeze and cook-chill began to receive more attention when administrators found that convenience food products were more costly (Light and Walker, 1991; Herz and Souder, 1977) and did not meet the needs of the hospital customer in terms of variety, quality, and nutritional content (Light and Walker, 1991; Harder, 1972 ; Rinke, 1976).

In recent years more attention has been given to the ready food production processes. Ready foods which include cook-freeze and cook-chill have been demonstrated to increase the quality and quantity of productivity by 1) incorporating manufacturing principles into food production, 2) separating the food preparation stage from the foodservice stage, and 3) leveling the peak periods of activity in the foodservice operation. The popularity of cook-freeze as an alternative began to decline as research and usage revealed problems with changes in the textural properties of food due to the freezing and thawing process as well as the increased use of electricity for the process (Light and Walker, 1991).

Although hospitals, nursing homes, elder care, and life care communities represent healthcare, the third largest institutional foodservice market segment, there has been little systematic, controlled research on controlling costs and increasing productivity in these environments (Light and Walker, 1991; Green and Weaver, 1990; Matthews, 1982b). Few studies on hospital foodservices systems have provided sufficient data to develop models that could be used by hospital administrators in making decisions regarding the selection of a hospital food production process (Unklesbay et al. 1977; Matthews, 1982a & b). The basis of this research is the need to examine the decision process of selecting a food production process. The focus of this study will be the development and testing of a model for the decision process of selecting cook-chill production in hospital foodservices.

Historical Perspective on the Hospital Environment

A review of the dynamic healthcare environment since 1900 (Table 2) provides a historical perspective on the evolution of the complex environment within which hospital foodservices must operate (Schulz and Johnson, 1983). At the risk of over simplifying, it can be determined that there were four major periods in evolution of healthcare during the period 1900 to 2000: the trusteeship period, physician period, administrative period, and team period (Schulz and Johnson, 1983).

Trusteeship Period

The trusteeship period was characterized by hospitals which were founded by trustees, religious orders, or philanthropists. The economic and political environment had little impact on hospitals during this period. The social perception was that hospitals were charitable institutions.

Physician Period

The gradual entry into the physician period occurred simultaneously with progress in medical technology. In the economic environment, Blue Cross and Blue Shield insurance was started as a way to help patients pay for healthcare costs. As labor unions grew, more and more people bargained for the health insurance coverage. Politically, the government entered the healthcare environment after World War II in 1946 with the Hill Burton Act which primarily provided funds to rural, private hospitals for construction of and equipment for facilities (Sullivan, 1990). The attitude of hospitals was the "bigger the better" (Rosenstein, 1986).

The quality of a hospital was based on its size, diversity of services, research, technology, and equipment. Costs were not a major issue. One of the provisions of the Hill Burton Act was that hospitals receiving federal funds would provide free medical care to

TABLE 2

Stages in Hospital Management in the Twentieth Century

	Health Services	Environment		Implications for hospital	
Years	Technology	Economic	Political	Objectives	Management
I. TRUSTEESHIP PERIOD					
1900	Application of modern public health measures	Limited resources provided by donations, free service from religious groups and physicians, and payments by individuals	Limited mainly to local government support of public hospitals in larger cities	Mainly comfort services to the poor and dying	Solicit donations and pinch pennies; Trustees or religious members dominate
1910	Reform in medical education (Flexner report)			Illness intervention through surgical services	
	Rise of modern surgery				
II. PHYSICIAN PERIOD					
1920	Development of medical specialization				Meets needs of individual MDs.

	Health Services	Environment		Implications for hospital	
Years	Technology	Economic	Political	Objectives	Management
1930	Progress in therapeutics	Private insurance as Blue Cross developed and expanded. Increasing resources		Rise of diagnostic and curative medicine	MDs begin to dominate as technology advances and hospitals depend on patient receipts
1940	Development of laboratory medicine		Expansion of private hospitals through federal funds (Hill-Burton)		
1950					
III. ADMINISTRATION PERIOD					
1960	Explosion of medical research and knowledge and application of nuclear, immuno logical, etc. technologies Proliferation of specialties; expanded nursing role	Increasing government control of resources (Medicare-Medicaid)	Increase access to care and quality	Expand scope, sophistication, volume, income, and facilities	Rise of hospital management to coordinate complex organization, obtain external resources, and develop facilities. Administrators dominate
1970	Team medicine				

	Health Services	Environment		Implications for hospital	
Years	Technology	Economic	Political	Objectives	Management
1970 (cont'd)					
			Cost containment attempts by regulation		
1980				Multi-institutional system development	Corporation management apply advanced management technologies; cope with external and internal confrontation
		Restricted resources	Cost containment by competition		
			Cost containment by resource limits		
		Employer controls over costs	Employer controls over services		
IV. TEAM PERIOD					
1990	Manpower surpluses. Self-care medicine				Team management
				Consolidate services	
2000					

Note. From Management of Hospitals (p. 73) by R. Schulz and A. C. Johnson. 1983. New York: Copyright by McGraw Hill.

cured from almost any medical condition.

Advances in medical technology improved the level of care and increased the mystique of the physician over the hospital trustees. The power of the physician in all matters related to the management of the hospital increased dramatically. During the period 1950-1966, the average annual increase in healthcare costs was 6.9%.

Administrative Period

During the administrative period, technology expanded at an unpredented pace. The sophistication in technology changed the role of the physician who had previously practiced as an individual. Medical advances required a team of specialists in the areas of radiology, pathology, and anesthesiology. The healthcare sector of the United States economy experienced the largest growth of any sector (Schuster, 1980). Economic and political changes were vast during the period as demonstrated by the introduction of Medicaid and Medicare which were implemented in 1966. During the 1960s and 1970s hospital services became more sophisticated. Beginning with mid 1966 to 1970 there was a major increase in healthcare cost to an average of 14.8% annually (Schulz and Johnson, 1983; Koncel, 1977).

The political environment reflected both social and economic changes. "Survival of the fittest" became the phrase for the 1980s when escalating healthcare costs continued to be an issue for the consumer, the government and the healthcare industry (Schuster, 1980). The government began to cover a larger share of hospital billing through Medicare and Medicaid. Increased government regulation over payment became a natural consequence. Government regulation was increased in October, 1984 with the introduction of diagnostic related groups, DRGs, which were contractual healthcare services pricing agreements to control excessive, unjustified hospital charges (Meyer, 1986).

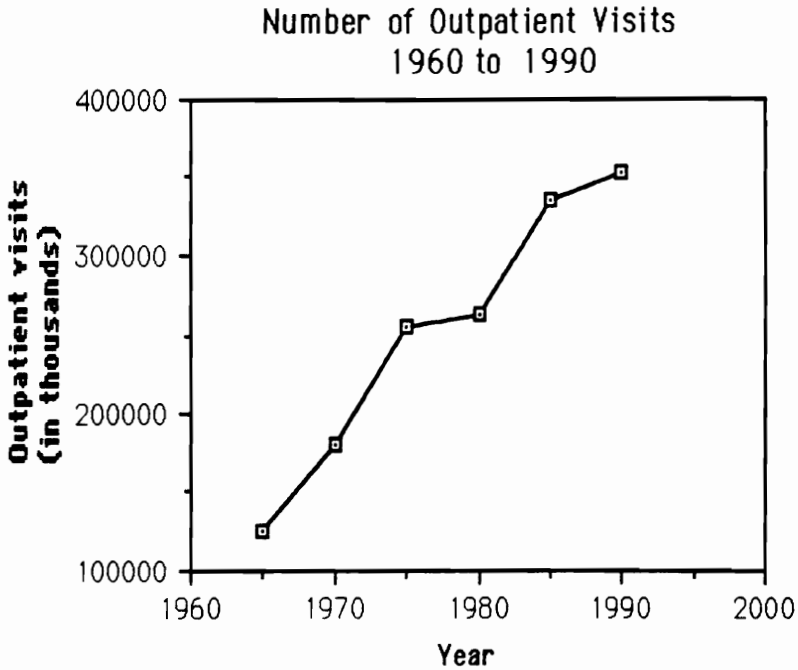


FIGURE 2 Increase in Outpatient Visits in U. S. Hospitals, 1960 to 1990

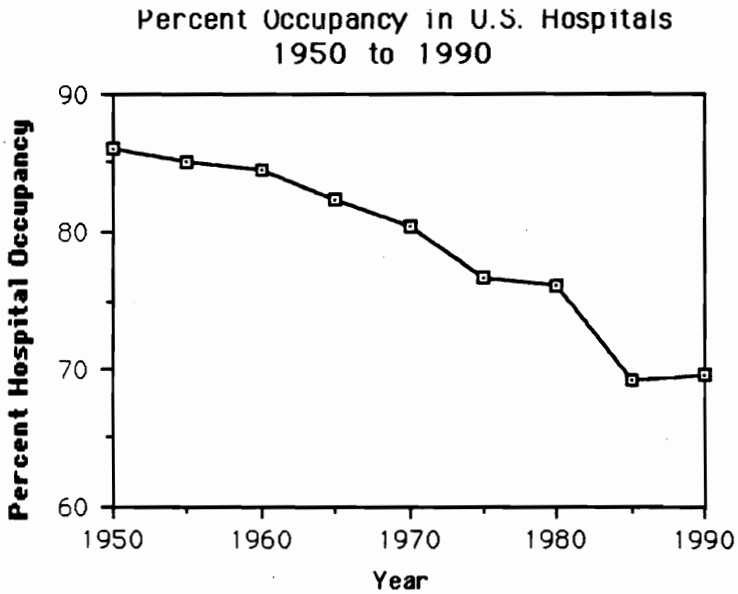


FIGURE 3 Percent Occupancy in U.S. Hospitals, 1950 to 1990

Note. From American Hospital Association: Hospital Statistics, 1990, American Hospital Association. Copyright 1990 American Hospital Association.

in 1978. As a result, there was a gradual shift from inpatient to outpatient care with a reduction in hospital census and inpatient revenues (Figure 2) (Schuster, 1980). The average length of the hospital stay dropped and average occupancy rates declined to 66.6% (Figure 3) which was the lowest rate in 40 years. There continues to be a declining use of hospitals by people under 55 years of age due to the availability of diversified outpatient services (Figure 4). The ingredients for hospital survival became cost efficiency and case mix management.

The climate began to change between 1975 and 1978 when 231 hospitals closed (Rosenstein, 1986) (Figure 5). The primary reasons for closure were: financial instability, replacement by a new facility, low census, outdated facility, lack of medical support staff, and changing focus of medical services (Rosenstein, 1986). As the financial woes of hospitals increased, small hospitals became a desirable prey for publicly traded profit making hospital chains such as Humana, American Medical International, National Medical Enterprises, Hospital Corporation of American, and Beverly Enterprises (Schuster, 1982). The prediction that 25 multi-hospital systems would control most of the nation's hospitals by 1990 was not far from true (Rose, 1986). The trend of the 1980s was interdependence as opposed to independence as was seen by the large numbers of hospital mergers and acquisitions (Schuster, 1982).

The success of hospital chains has been based on the ability to generate increased amounts of capital and to reduce costs through volume buying and the economies of scale (Rosenstein, 1986). Wall Street investors were convinced of the positive future of publicly traded profit making hospital management firms when these firms showed a growth rate of 25% for each year during the period 1972-1982 (Schuster, 1982). Independent hospitals criticized the publicly traded for-profit hospital management chains. Their concern was that these companies would promote high cost medicine with high cost

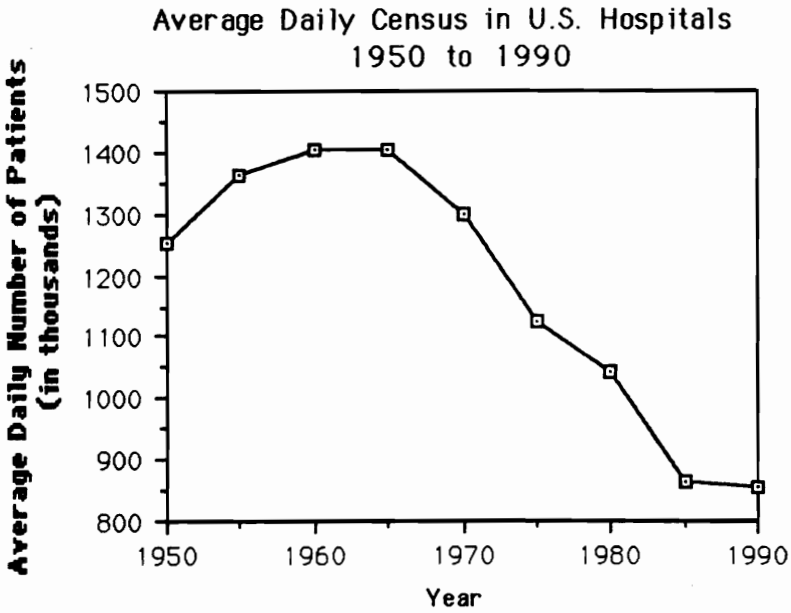


FIGURE 4 Average Daily Census in U.S. Hospitals, 1950 to 1990

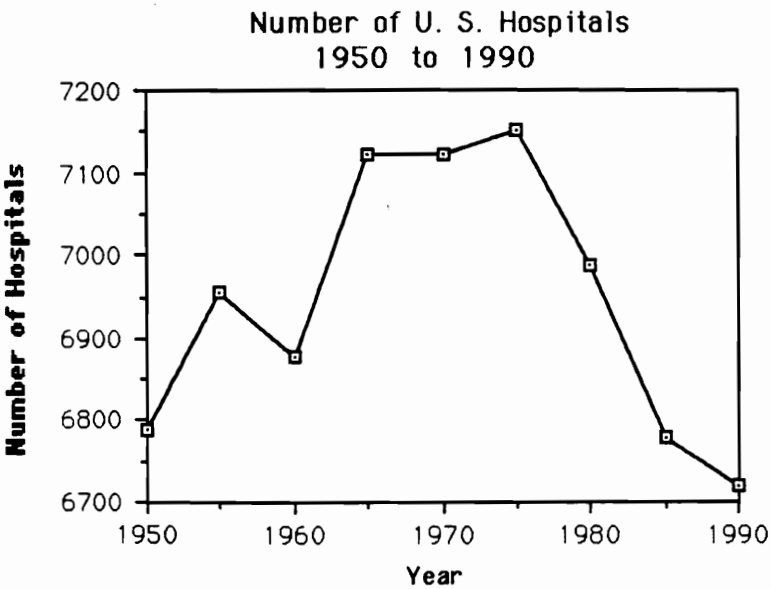


FIGURE 5 Number of U.S. Hospital, 1950 to 1990

Note. From American Hospital Association: Hospital Statistics, 1990, American Hospital Association. Copyright 1990 American Hospital Association.

technology and thereby exclude patients who had need for extensive services, but were not insured. Foodservice administrators at independent hospitals have been concerned about the growth of profit making chains based on the fear of more competition in a market that was already weakened by decreasing revenues and lack of effective cost containment.

Team Period

For the 1990's and beyond, it is clear that the environment for hospitals is uncertain. Medicare cuts of $5.5 billion dollars in 1990 promise to make the financial decisions of the providers of healthcare even more difficult in the decade ahead (Burke, 1990). The 1991 forecast predicted more mergers and acquisitions ahead (American Hospital Association, 1990).

Technology will continue to advance. Self care technologies will allow patients to be more of a team member in their own healthcare. The growing healthcare needs of the aging population will create a demand for more healthcare support personnel. The technological and political changes that are occurring will have an significant impact on hospital objectives and management. Administrators will realize the need to expand from institutional interest to community interest to survive in a competitive healthcare environment (Schulz and Johnson, 1983).

The Impact on Hospital Foodservice Operations

Increased competition and uncertainty in healthcare created a turbulent environment for hospitals which translated into a need for hospital foodservice operations to become financially sufficient by increasing revenue through improved productivity. In 1970 foodservices comprised 6.2% of hospital expenditures, by the early 1980s the cost of foodservices increased to 13.2% (Franzese, 1981a). Even as long ago as 1971, it was clear that the conventional, cook-serve, foodservice system was an "anachronism" in its

own time (Donaldson, 1971). At that time, dietitians were challenged to be innovative in directing changes by implementing new technology to existing circumstances.

In the early 1980s, the steps hospital foodservices took to improve profitability were streamlining purchasing, increasing productivity, and marketing (Schuster, 1982; Pickens and Shanklin, 1985). Traditional cost containment procedures such as increased control of purchasing, inventory, receiving, food cost, labor cost, and operational cost (Coltman, 1987; Berkman, 1980) by themselves were no longer enough to address the escalating expense of hospital foodservices.

The nature of the most common hospital foodservice production system, the conventional cook-serve system, was and continued to be inherently inefficient when compared to other foodservice production alternatives (Schuster, 1980). More and more hospital foodservice administrators began to take a look at convenience, cook-freeze, and cook-chill production alternatives which would help in the struggle to contain cost and increase productivity (Berkman, 1980; Carroll, 1980; Cipolla, 1990; Franzese, 1981b, 1984; King, 1989a, b, & c; Koncel, 1976; Lippe, 1983). Although alternative systems were expected to be more successful with controlling costs, food product safety, product consistency, and increasing productivity (Ridley, Matthews, and McProud,1984; Rinke, 1976), their acceptance was limited due to the initial capital investment expense, seemingly limitless labor pool, and concerns regarding safety and consistency of foods prepared by these alternative foodservice systems (Lyman, 1981).

Cost containment became the primary buzzword of the 1980s as hospital foodservices which were traditionally an auxiliary, subsidized services to patients, visitors and hospital employees were expected to become financially solvent through breaking even or, in some cases, becoming a profit center (Schuster, 1980).

most efficiently and effectively manage their operations in an uncertain environment. A review of foodservice operations revealed that hospital foodservices are more labor and menu item intensive than any other type of foodservice operation (Matthews, 1975). Although the choices of alternative foodservice production processes are: conventional, convenience, cook-freeze, and cook-chill, it should be noted that few foodservice production processes,exist in a pure state. More often foodservices will use a combination of two or more production processes.

The focus of this research will be the selection of cook-chill, an alternative food production processes, which involves food preparation followed by rapid chilling and storage until use. Cook-chill food production incorporates the principle of "cooking to inventory" which involves the preparation of food in large quantities in advance of time of service. This production process permits a foodservice operation to become more productive and efficient through economies of scale and the use of long, as opposed to short production runs. The following review of literature concerning alternative food production processes clearly indicates that cook-chill food production has been promoted as the solution for today's uncertain financial environment where food and labor costs as well as a demand for quality food products continue to increase. The lack of empirical research concerning foodservice production processes makes it difficult to systematically compare each of the alternative production processes. A review of 91 articles on foodservice production processes during the period 1950-1990 reveals that although 72 (79%) of the articles were located in professional journals, only 5 (5%) were based on empirical research methods (Tables 3 &4). The bulk of the articles were descriptions or promotions of specific foodservice production processes and were based on isolated single site case studies (Green and Weaver, 1990). The chronological dispersion of the articles written on foodservice systems limited the recency of the research that could be included in the review (Table 5).

TABLE 3

A Review of Sources and Numbers of Foodservice Systems Articles, 1950-1990

Non-professional Journals		Number of Articles
The Consultant		3
Food Management		8
Foodservice Marketing		3
Modern Healthcare		3
Restaurant Business		1
School Foodservice Journal		1
	subtotal=	19
Professional Journals		
Cornell Hotel Restaurant Administration Quarterly		2
Hospitals		29
Journal of Food Science		3
Journl of Food Protection		1
Journal of Food Technology		1
Journal of Foodservice Systems		8
Journal of the American Dietetic Association		15
Journal of the Canadian Dietetic Association		4
School Foodservice Research Review		5
Journal of Hospital Infection		2
Society for Advancement of Foodservice Research		2
	subtotal=	72
	Total Number of Articles=	91

TABLE 4

Nature of Articles on Foodservice Systems, 1950-1990

Nature of article	Frequency	
	Number of articles	Percentage of articles
analysis	21	23%
case study	22	24%
descriptive	28	31%
promotional	7	8%
empirical	5	5%
taxonomy	2	2%
model	6	7%
Total	91	100%

Historical View of Foodservice Systems

The conventional foodservice system (Figure 6), which dates back to the nineteenth century, involved storage, preparation, cooking and holding, service, dining, clearing and dishwashing (Jones and Heulin, 1990). More modern foodservice systems have evolved due to the need to control food cost, quality, and consistency and to adapt to the lack of skilled labor. Advances in food technology such as partial or complete processing of raw foods which may extend the shelf life and reduce preparation time have facilitated the modification of the traditional foodservice system. Today's modern foodservice system is composed of purchasing, receiving, storage, production, delivery/ service, and clean-up. Each of these components (Figure 7) represents a process in the foodservice system. Regeneration and transport are two processes added to the ready food systems (Jones and Heulin, 1990). All of the suggested models are generic in nature and most operating foodservices may not fit precisely into any of the frameworks since processes can be customized for specific situations.

There is lack of agreement on a model that covers all types of foodservice systems. The operations management approach to examining a system is to trace the flow of raw materials (Sasser, Wycoff and Olsen, 1976; Shostack, 1984). The type of system selected and designed will depend on the state of the food delivered to the operation, the clientele, equipment, and skills of the staff.

Nomenclature in Foodservice Systems

One of the reasons for confusion regarding the types of foodservice systems is the inconsistency of nomenclature. Attempts have been made to simplify the naming of components of foodservice systems by Escueta (1986), Jones and Heulin (1990).

TABLE 5 Historical Perspective on Review of Foodservice Systems Literature

Category	1950	1960	1970	1980	1990
Number of articles written	1	1	43	44	2
Nature of research sample					
general	0	1	1	6	1
hospitals	1	0	30	35	0
schools	0	0	8	1	0
hotels	0	0	1	0	0
extended care	0	0	0	1	0
no sample specified	0	0	1	6	1
Type of article					
analysis	0	1	11	9	0
case study	0	0	8	13	0
descriptive	1	0	16	11	0
promotional	0	0	0	6	1

TABLE 5 Historical Perspective on Review of Foodservice Systems Literature
(continued)

Category	1950	1960	1970	1980	1990
empirical	0	0	3	2	0
taxonomy	0	0	0	1	1
model	0	0	4	2	0
Statistical methods used					
Descriptive					
frequencies	0	0	4	5	0
means	1	0	9	5	0
probability	0	0	0	1	0
range	0	0	0	1	0
standard deviation	0	0	1	1	0
median	0	0	0	1	0
Inferential					
ANOVA	0	0	5	4	0
ANCOVA	0	0	1	1	0
chi square	0	0	0	2	0
correlation coefficient	0	0	0	1	0
coefficient of determination	0	0	0	1	0
factor analysis	0	0	0	1	0
regression	0	0	0	1	0
t-test	0	0	2	0	0

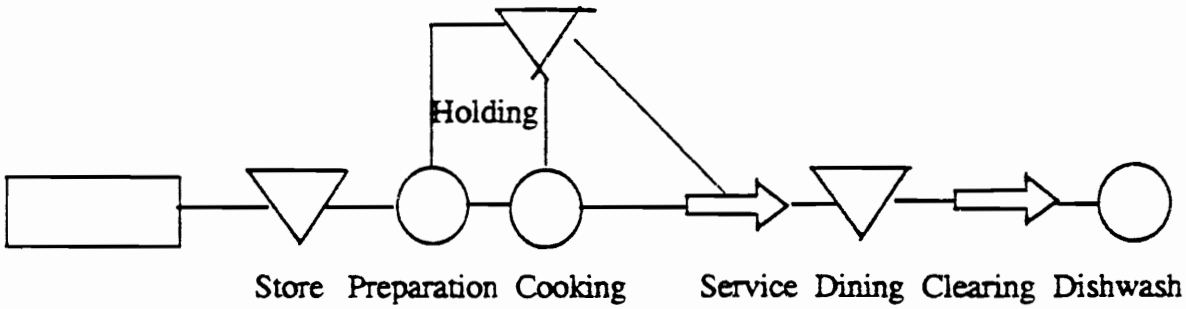


FIGURE 6
Flow Diagram of Conventional Foodservice Systems

Note. From "Foodservice systems - generic types, alternative technologies and infinite variation" by P. Jones and A. Heulin, 1990. Journal of Foodservice Systems, 5, p.303-304. Copyright 1990 by the Food & Nutrition Press.

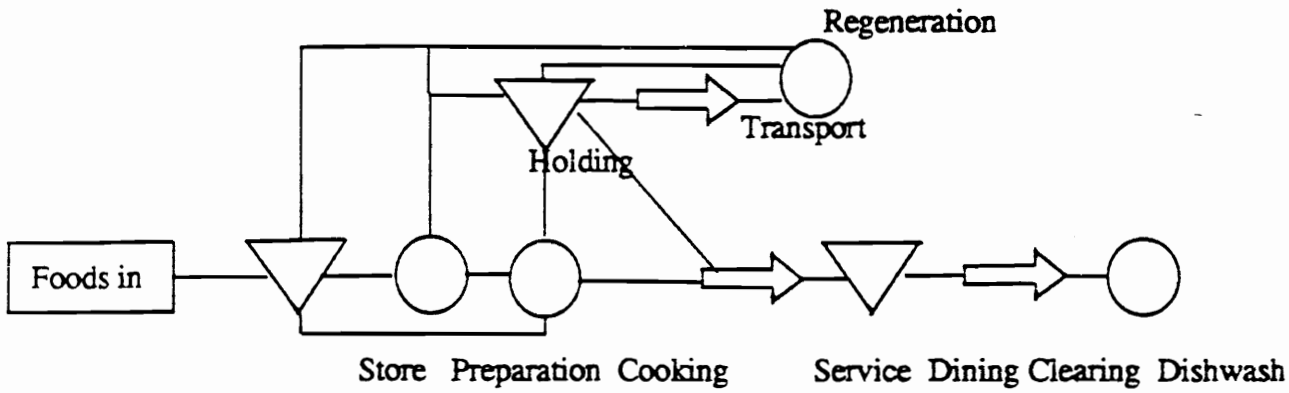


FIGURE 7

Flow Diagram of Modern Foodservice Systems

Note. From "Foodservice systems - generic types, alternative technologies and infinite variation" by P. Jones and A. Heulin, 1990. Journal of Foodservice Systems, 5, p.303-304. Copyright 1990 by the Food & Nutrition Press.

Even among those who attempt to simplify nomenclature, there is a lack of consensus. A recent survey of 300 foodservice operators by Wechsler (1990) in Foodservice Trendspotter, a quarterly publication by the National Foodservice Panel, Inc., indicated that only 71% of the respondents said they clearly understood each alternative food production process.

Review of Foodservice Production Processes

Although several researchers have attempted to assess the expenses associated with capital equipment outlay and operational expenses of each alternative food production process, the superiority of one system over others has not been clearly supported in the literature (Freshwater, 1980; Greathouse, Gregorie, Spears, Richards, and Nassar, 1989). The most extensive financial research to date was done by Freshwater in 1980. Greathouse and Gregorie (1988) have challenged the validity of this works since all figures were hypothetical. Due to the lack of conclusive, clearcut data, the following review of foodservice production processes will be confined to existing information :

a. operational definition

b. human resources

c. cost control

d. advantages

e. limitations

Conventional Production Process

a. Operational definition.

The conventional process is based on the use of raw food ingredients which are prepared and served the same day.

b. Human resources.

In a hospital foodservice which uses the conventional production process, there will be a need for a large production staff to work not only the day shifts, but also the

weekends and evenings (Goldberg and Kohiligan, 1974; Kaud, 1972). There is inherently low productivity with conventional processes due to the peaks and valleys in production (Donaldson, 1971).

c. Cost control.

In a conventional process, labor cost will usually be higher due to the need to cover day, evening, and weekend shifts and due to the need for higher skilled people who prepare food from "scratch." Food purchased in the the raw state as opposed to the processed state will usually be less expensive, however.

d. Advantages.

A survey of 807 hospital foodservices (Greathouse and Gregoire, 1988) revealed that the conventional production process remains the prevalent choice. The choice of foodservice production system has been shown to be dependent on size and location of the hospital. The conventional production process is more prevalent in smaller hospitals which are located in more rural hospitals (Greathouse and Gregoire, 1988). The conventional has been the most frequently used process for many years due to its familiarity. One advantage of the conventional is freshness of product due to on-site production for service the same day. Customer survey results often support the conventional menu over the a la carte convenience menu (Reed, 1973). Some foodservices chose the conventional process, due to the aesthetics of having the food prepared on-site. In a comparison of food production processes, conventional, also called cook-serve, food products received higher ratings based on food appearance, flavor, quality and plate waste (Harper, Jansen, Shigetomi, and Fallis, 1972).

e. Limitations.

The limitations of the conventional process, particularly in an environment where labor shortages are common, is the need for large amounts of skilled labor.

Convenience Production Process

a. Operational definition.

In the purest sense, a convenience production process would be one that does not have a traditional kitchen with pre-preparation, preparation, dishwashing, and potwashing equipment, but does have a food assembly area (Rinke, 1976). Convenience foods are those foods that have been partially or totally processed off site. All food items, including modified meals, would be obtained from an outside vendor in a pure convenience production process.

b. Human resources.

There is a decreased need for labor in the convenience production process. Since food items arrive only to be opened, allowed to thaw and serve, or heat and serve, the need for skilled labor is particularly decreased (Rinke, 1976). However, because conventional production of special diet menu items is often needed to supplement the convenience production system, reductions in labor force are not always possible (Harder, 1972)

For a convenience production process to be successful, full cooperation of the kitchen staff is needed. Employee support is required for their retraining in production and handling processes. The change from conventional to convenience production has been shown to result in decreased employee morale because the staff did not take pride in simply thawing and/or reheating meals (Harder, 1972).

c. Cost control.

The foods purchased for a convenience production process will necessarily be higher in price than the specific raw components due to the built in cost of manufacturing the product (Rinke, 1976; Rappole, 1973). In a comparison study of the costs involved with convenience, cook-freeze, and cook-chill foods, Herz and Souder (1977) found that convenience foods were the most expensive to serve. A study conducted in 1972 showed

that convenience entrees, salads, and desserts increased the cost of a meal from $0.37 to $0.43 (Harder,1972). To be cost effective, the introduction of a convenience production system should result in the reduction in number of employees on the production staff to a point where total food sales are equal to total costs (fixed costs plus variable costs). In addition, the higher food cost should be offset by the lack of the necessity to have a fully equipped conventional kitchen for processing food from the raw state (Rinke, 1976). Since all items, particularly special diets, are not commercially available in a convenience form, cost savings from not having a fully equipped kitchen have not always been realized in hospitals

d. Advantages.

Early convenience foods had drawbacks that have been overcome in recent years. Improvements have been made in food quality and handling instructions. Labeling of nutritive content, however, is still inadequate in many products. Although proponents of the convenience system suggest that the advantages are ability to offer more variety in menu items, this has not been supported in the literature.

e. Limitations.

The limitations with convenience products are numerous. The limitations are inability to exactly meet the nutritional needs of the hospital patient (Buchanan, 1974a; Rinke, 1976) and lack of consistently high quality products at reasonable prices (Harder, 1972; Rinke, 1976). Lack of thorough labeling of ingredients and directions for processing have also been complaints (Rinke, 1976). In terms of cost, convenience foods will necessarily be higher in prices than their raw ingredients due to the need to build in the processing cost (Rappole, 1973; Rinke, 1976).

All of the advantages of the convenience system have been offset by the reported lack of high quality product at a reasonable price (Rinke, 1976). Several sources cited the reason for abandoning the convenience option was the failure of convenience food

manufacturers to research and develop products that more adequately meet the needs of hospitals.

Another important issue is the safety of convenience products. Distribution from the manufacturer to the hospital has been a concern (Rinke, 1976) since the Hazard Analysis Critical Control Point (HACCP) has become a more wide spread tool (Rinke, 1976; Harder, 1972) for assuring the safety of the food supply. Environmental issues are also considered. For instance, the ecological impact of the large amount of disposable waste created by disposable tray service was considered to be a hindrance as long ago as 1976 (Rinke, 1976).

Both cook-chill and cook-freeze are examples of "ready foods," a term coined by Rappole at Cornell in 1973. The ready food concept is based on the premise that food held at colder temperatures has less nutrient loss, increased food safety, and higher retention of quality. In 1976, Rinke predicted that due to increased labor costs, future foodservice production processes will be based on chilled or frozen foods.

Cook-freeze Production Process

a. Operational definition.

Cook-freeze as well as cook-chill are types of "ready foods" that are prepared in advance for service at a later time. In cook-freeze, foods are prepared in large quantities, individually portioned, blast frozen, and stored for reheating (Rinke, 1976). Cook-freeze is based on the principle that food is prepared using traditional procedures and typical foodservice equipment . Quick freezing allows for the retention of nutrients and quality.

b. Human resources.

Labor requirements for the cook-freeze system are reduced through specialization of work and through use of highly skilled employees only five day weeks. More highly

skilled employees can be hired at better wages due to the overall reduction in labor hours needed to produce the necessary volume of food items (Harder, 1972). This could be seen as a disadvantage in a labor market where there is a shortage of skilled labor (Rinke, 1976). Carroll (1980, 1981), however, compared the labor time required in the conventional and cook-freeze production process and found no significant differences. He suggested that anticipated reduction in labor time not be considered a critical factor in the decision to select cook-freeze over conventional.

c. Cost control.

There is a lack of agreement with regard to the cost savings of a cook-freeze production process. Greathouse et al. (1989) compared the costs associated with conventional, cook-freeze, and cook-chill to find there was little difference in the operation costs of each process. The design of their research has been of concern to many industry experts who believe that the results were nonconclusive in that the cost of delivery was added to the cost of production in the cook-freeze and cook-chill processes.

There are conflicting opinions on the cost effectiveness of cook-freeze. Goldberg and Kohiligian (1974) reported that the increased energy needed in the processing (chilling and freezing) of ready foods was offset by the reduction in the production time from seven to five days per week. When food, labor, freezing, and reconstituting costs were combined the cook-freeze systems was found to be the least costly (Goldberg and Kohiligian, 1974; Rinke, 1976). Operational data from a cook-freeze production process used at United Leeds Hospital in Leeds England showed improvement in a 10% reduction in food waste, 50% increase in productivity, 14% reduction in equipment utilization, and no change in food cost (Glew, 1973; Rinke, 1976)

d. Advantages.

The advantage of this style of "convenience" product is that food production can be prepared according to nutritional specifications. This results in products that meet the

specific dietary needs and cultural tastes of the customer. Moreover, packaging can be according to typical use patterns, and there is less dependence on supplies from an outside vendor. Most importantly, food safety is more controlled because the responsibility has been shifted to the hospital food production facility (Rinke, 1976).

e. Limitations.

One of the major drawbacks of the cook-freeze system is the cost of developing a properly equipped test kitchen. The test kitchen is required because conventional recipes must be reformulated to withstand freezing and thawing without affecting quality. Rinke(1976) recommended the assistance of a food technologist in the development of recipes for cook-freeze production. Because of these costs, cook-freeze is often recommended for only high volume production operations or commissary operations serving the same menu to several operations.

United Leeds Hospital in Leeds, England was one of the first cook-freeze systems (Glew, 1973). Food produced at this hospital was cooked to slightly underdone stage in order to allow for further cooking in the reconstituting process. Hot food was packed into eight portion units and blast frozen in molds. After freezing the food was removed from the mold and placed in polyethylene bags. Reheating occurred in the hospital wards with hot air convection heat. Careful attention was given to the development of recipes to permit freeze-thaw stability.

Cook-chill Production Process

a. Operational definition.

Cook-chill is a "ready food" process which involves traditional food preparation techniques and typical foodservice equipment coupled with quick chilling by either blast freezers or tumble chillers. Chilling as opposed to freezing allows for the retention of taste, consistency, and appearance of food product. (Cipolla, 1990).

b. Human resources.

There is a lack of consensus among users of cook-chill with regard to the ability to reduce labor costs. Hospital foodservices with cook-chill have documented a reduction in employee turnover after the installation of the process (King, 1989a,b, &c). According to Rinke (1976) the cook-chill process improves quality, increases productivity, more evenly distributes the work flow, and decreases labor and food cost. When the ingredient room process is incorporated with the cook chill production, the benefit of lower food cost is enhanced.

c. Cost control.

Several cook-chill operations have documented a reduction in costs and an increase in profitability (Vulcan Hart, 1991). Cook-chill has been shown to be more cost effective with regard to energy when compared to cook-freeze. The cook-freeze process has been reported to use 18 times more BTUs than the cook-chill (Bean, 1985; Stilwell, 1987). One of the primary concerns of the cook-chill production system is the initial capital investment (Harder, 1972). Koogler and Nicholanco (1977) reported that hospitals with fewer than 300 beds would find it difficult to justify the capital investment in cook chill. It was their contention that lower volume operations would not be able to benefit from the food and labor savings characteristics of cook-chill production.

One example of a successfully implemented chilled food system is the Nacka system which was initiated in 1963 at Nacka Hospital in Stockholm, Sweden. Nutrition and bacteriological assessment of food prepared by this system revealed that the values were consistent with those of freshly prepared food items (Rinke, 1976). A modified Nacka system was pilot tested in three hospitals in South Carolina by McGuckian (Rinke, 1976). Operational efficiencies of increased productivity, lower food and labor cost, and improved working conditions as well as high patient acceptance were reported (Rinke, 1976).

d. Advantages.

Based on the review of food production processes, cook-chill appears to offer several positive attributes:

1) potential to reduce labor costs or increase productivity,
2) potential to reduce food cost,
3) potential to improve food safety, and
4) potential to insure consistency of product quality.

e. Limitations.

The benefits are not universally accepted. Greathouse et al. (1989) compared actual financial data from conventional, cook-chill, and cook-freeze operations to find no cost benefit of one production alternative over the others. Operational disadvantages are that the food is not served fresh and that extensive attention to microbial growth must be a constant concern.

Food Assembly, Delivery, and Service Processes

For a total foodservice system to be efficient, all processes should interface. In the selection of a production process, consideration should be given to the service/delivery process. A point that is unclear to many foodservice administrators is that the selection of a specific production process neither establishes nor restricts the selection of a specific service/delivery process.

Newer food production processes such as cook-freeze and cook-chill have necessitated the addition of three additional processing steps after production: meal assembly, meal distribution, and meal service (Dahl, 1982). The examination of new technology in food production processes would not be complete without an emphasis on the satisfaction of the end user, the customer. Production equipment selection is an important factor that must be considered simultaneously with an emphasis on an end, serving quality food.

Acceptance or non-acceptance of a food production process is often based on customer assessment of the quality of the product that has been altered by meal assembly,

distribution, and service. Concern for the satisfaction of the patient begins a focus on the quality of the food produced by cook-chill as opposed to the quality of the cook-chill equipment (Hysen and Harrison, 1982).

It is clear that selection of a food production process does not dictate the type of meal assembly, distribution, or service. In a review of the alternatives in meal assembly, meal distribution, and meal service, Hysen and Harrison (1982) point out how the quality of an end product of any production process can be altered by the choice of alternatives in assembly, distribution, and service.

Meal Assembly

Meal assembly involves the actual portioning of food onto a plate, tray, or steam table pan. Two variations of assembly process are bulk or preplated (Figure 8) (Hysen and Harrison, 1982). According to Dahl (1982), bulk assembly, such as centralized tray assembly, results in the service of a higher quality product because that all activities are usually under the control of one supervisor.

Meal Distribution Processes

The meal distribution process consists of all the activities involved in the movement of assembled tray units from the point of assembly to the patient service area. The critical ingredient in this process is the maintenance of food at the proper temperature (Hysen and Harrison, 1982). Studies at the Swedish Food Institute in Goteborg, Sweden have shown that hot holding of food effectively destroyed the sensory quality of food that had previously been carefully selected and processed (Bengtsson and Dagersborg, 1978). To reduce the negative effect of hot holding, it is necessary to minimize the time between preparation/reheating and service. Although thermal retention/support of both hot and cold is a critical factor in the acceptability of the final product, hot food holding has been of the greatest concern (Glew, 1973).

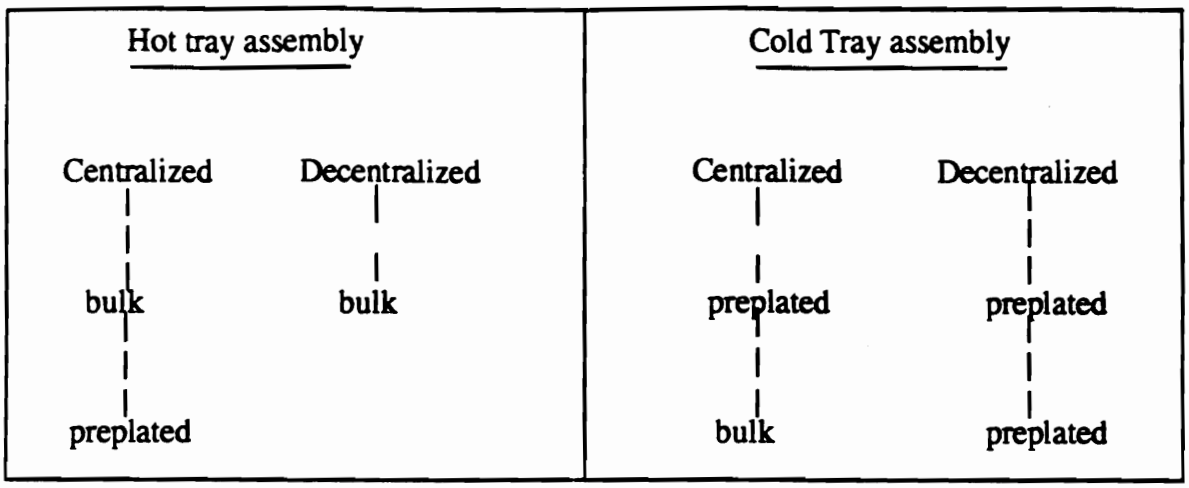


FIGURE 8 Meal Assembly Processes

The three basic types of equipment (Figure 9) used in hot thermal retention are: pellet system, insulated components, and heat support cart. The pellet system is based on the retention of heat in a closed system. Insulated components are another possibility for thermal retention/support. In this process the main entree dish is enclosed with an insulated cover and insulated bottom liner. The third alternative for hot retention is the heat support cart with heating units and disposable pans. Since the heat support cart is a more complex system, there is a greater potential for increased maintenance and repair problems.

Hot and cold thermal retention.

The four methods of hot and cold thermal retention are pellet refrigeration, split tray, match-a-tray, insulated trays and insulated components. Pellet refrigeration method separates the hot and cold food, but is not powered to continue heating and cooling. The cost of the carbon dioxide that is used to maintain the cold temperature compartment is a cost constraint of the method. The split tray method involves placing hot and cold food in compartments on the same tray. The hot foods are on one side the the cold on the other. The match-a-tray method preceded the split tray method. Match-a-tray involved the separate packing of each patients hot and cold food and the reassembling of the patients complete meal in the service area. The design of the insulated tray and components method has been improved over the years to better encapsulate hot and cold foods to prevent transfer of temperature

No thermal support.

The no thermal support method can be used where there is a short distance between the final preparation and the service of the food. Food is transported in a covered tray without any means of temperature support, therefore, the delivery must be immediate and responsive.

Hot thermal retention			
pellet system		insulated components	heat support (electric)
Hot and Cold thermal retention			
pellet refrigeration	split tray match-a-tray	insulated trays	insulated components
No thermal support			
Cold temperature support			
	umbilical refrigerated cart		remote refrigerated transport

FIGURE 9 Meal Distribution Processes

Cold temperature support.

The cold temperature support method does not require mechanical refrigeration equipment, but does maintain chilled food at the proper temperature.

Meal Service Process

The meal service process (Figure 10) involves all of the steps taken in the delivery of the assembled meal tray to the patient room or eating area. Rethermalization of the food can be accomplished by five types of equipment: microwave, convection oven, infrared ovens, integral heat ovens and carts, and contact platter heater carts.

Decision Making in Foodservice Operations

Decision makers in hospital foodservices are faced with the question of which food production process to select. Greathouse and Gregoire (1988) found that most operations continue to use conventional food production due to its familiarity. From the review of foodservice systems, it is clear that many factors must be considered in the decision to select a food production process. Foodservice literature provided little empirical data which would conclusively support the selection of one food production process over another (Freshwater, 1980; Greathouse et al. 1989, Greathouse and Gregorie, 1988).

In addition, few studies have provided guidelines for the *decision process*. Recent decision literature supports the belief that many decisions are made before the problem is clearly defined (Mintzberg, Raisinhani, and Theoret, 1976) and many decisions are based on an intuitive as opposed to an analytical strategic decision process (Nutt, 1989). Even in formal systematic decision analysis, many decision makers have their minds made up before all of the facts are known (Keeney and Raiffa, 1976).

According to Nutt (1989) an analytical strategy in the decision process will involve four stages: exploring possibilities, assessing options, testing assumptions, and learning. Using an intuitive decision strategy, a decision maker would attempt to simplify the

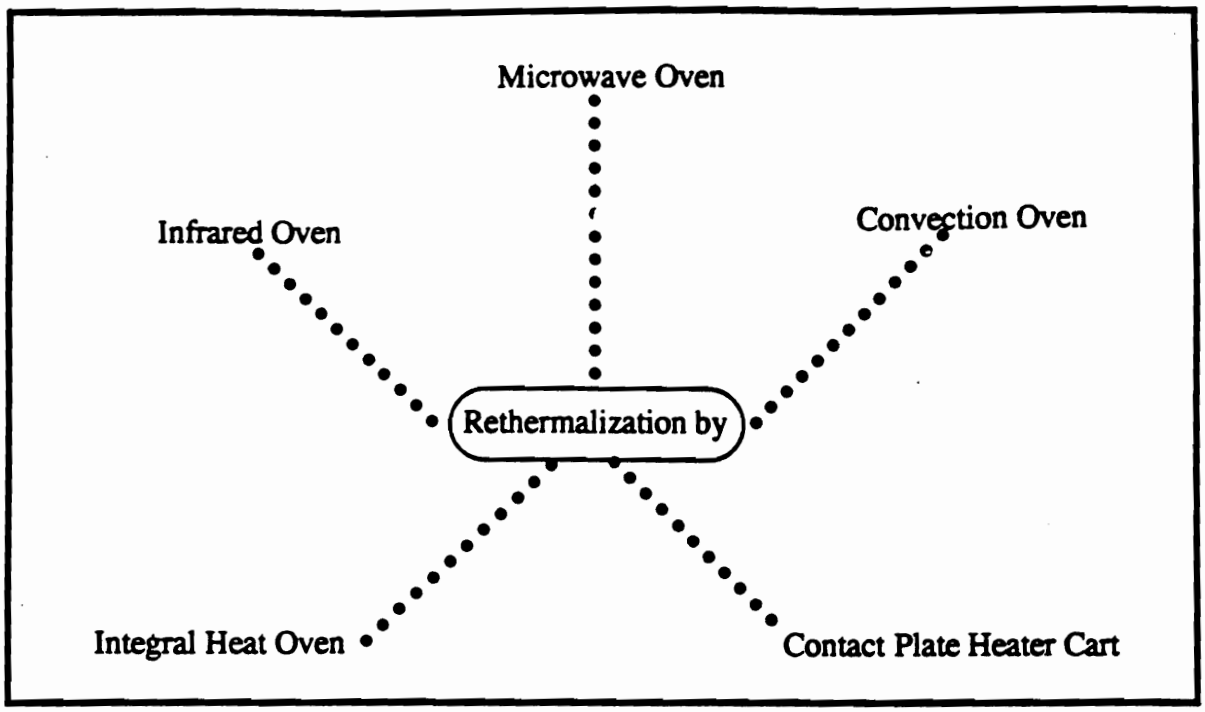


FIGURE 10 Meal Service Processes

decision by reducing the mass of information with which he must deal. Analytical and intuitive decision strategies can be said to fall at opposite ends of an information usage continuum. The higher the use of information in the decision process, the more analytical the decision strategy. The lower the use of information, the more intuitive the decision strategy.

Nutt (1986) has also said that when uncertainty is low, decision makers are more likely to systematically evaluate all aspects of the decision making process. When uncertainty increases, there is a tendency for decision makers to use a more intuitive approach.

Literature on foodservice production processes is replete with promotional, descriptive, and case studies. The lack of consistent nomenclature and empirical research makes the decision making process heuristic in nature. Cook-chill production answers many of the challenges faced by the foodservice administrator today. With interest in the cook-chill product increasing and knowledge of the production process less than complete, it becomes important to provide decision makers with the facts and a framework which will assist in the decision making process. It is for this reason that the goal of this research is to develop and test a decision making model for the selection of a cook-chill process in hospital foodservices.

Although cook-chill food production is clearly not a panacea for all cost, safety, and quality issues (Light and Walker, 1991), the process of the decision to select/not select cook-chill food production will be the focus of this study. The inherent characteristics of cook-chill's "cooking to inventory" answers the problem of low productivity due to peaks and valleys of production with conventional production. Centralized on-site production with cook-chill provides control over the nutritional value and quality of food as opposed to the purchase and use of standard convenience products. The less desirable characteris-

tics of cook-freeze with regard to quality, texture, and use of energy to rethermalize are not found in foods that have been cooked then chilled. Finally, although cook-chill production is used world wide, there has been little research carried out on its selection and use (Light and Walker, 1991; Green and Weaver, 1990; Greathouse and Gregorie, 1988).

There is no one perfect model for making all decisions particularly in an environment that is uncertain and having changing organizational goals. Not only is the decision process complex, but the lack of empirical research in foodservice production processes and systems results in inadequate and inappropriate information to make the decision. It is the intent of this researcher to build on the current body of knowledge regarding the decision process for the selection of cook-chill food production processes through the development and testing of a generic model for the decision process to select/not select

Purpose of Study

The major purpose of this research project is to develop a model for the process of selecting/not selecting cook-chill production in hospital foodservice operations. A second purpose is to determine the nature of the actual decision strategies, analytical versus intuitive, and their correlation with satisfaction with cook-chill.

Objectives of Study

1. To develop a generic model for the decision process of selecting/not selecting cook-chill food production for hospital foodservices
2. To test the generic model for appropriateness and statistical significance for use in the decision process to select/not select cook-chill food production for hospital foodservices
3. To determine the decision strategy, analytical versus intuitive, most predictive of satisfaction with the decision to select/not select cook-chill food production in hospital foodservices.

Independent Variables

The independent variables in this study were derived from the Delphi process in which experts listed factors considered critical in the decision to select/not select a cook-chill production process. The Delphi experts ranked the importance of each factor in the decision process. The sum of ranks of each factor provided a group consensus of importance of each factor in the decision process. Each important factor was analyzed in the framework of the generic decision model.

Dependent Variables

The dependent variables were dervied from the Delphi process in which a group of experts listed measures of perceived satisfaction in existence in a successful cook-chill operation. The Delphi experts ranked characteristics of a successful hospital cook-chill operation. The sum of ranks of each success characteristic provided a group consensus of importance of each characteristic in determining satisfaction with cook-chill. Each important characteristic was analyzed in the framework of the generic decision model.

For the purposes of this research, the term satisfaction will be used to signify the fulfillment of all demands or requirements of successful cook-chill operations. In other words, satisfaction is a function of the achievement of success. Both the independent and dependent variables determined to be important to the panel of experts were interpreted in the framework of the generic model of the decision process in order to identify the nature of the strategy in the decision making process.

Hypotheses

H1 Use of an analytical decision strategy in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H2 The extent of use of administrative decision support in the process of selecting/ not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H3 The extent of use of decision variables in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H4 The extent of use of parameters in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H5 The extent of use of performance measures in the process of selecting /not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H6 The extent of use of a computational model which uses variables, parameters, and performance measures in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

Need and Significance of Study

As hospital foodservice administrators look for solutions to problems of a dwindling supply of labor, spiraling food and labor cost, food safety and product consistency, the cook-chill production process, which involves "cooking to inventory ," becomes a viable alternative. The cook-chill production process, which has been touted to reduce labor cost, food cost, utility cost, increase efficiency, and improve food safety has been used extensively throughout Europe since the mid 1960s. In the mid 1970s, when it was initially introduced to the United States market, it was met with limited acceptance (Koncel, 1976; Rinke, 1976). The reasons for the poor reception of this process were plentiful supply of low cost labor, little emphasis on cost containment, initial set up cost for cook-chill, and lack of clarity with regard to food safety issues (Rinke, 1976).

Since 1980 there has been a dramatic increase in the number of cook-chill production process installations in the United States. Statistics indicate that there were 1400 cook-chill installations in a variety of institutional settings including hospitals, schools, nursing homes, college/universities, and prison systems in 1990. It is expected that there will be 3400 installations by 1995 with most of the increase in hospital foodservices (Vulcan Hart, 1991). Current cook-chill foodservices are operating with varying degrees of efficiency, customer acceptance, and profitability. The total costs of installation of cook-chill production process including structural modification and equipment requires a major financial commitment of the foodservice operation.

Hospital foodservice administrators who are considering a switch to the cook-chill production process might look to foodservice literature to gain insight into the process. A recent review of 91 articles written on food production processes between 1950 and 1990 revealed that most articles were descriptive and promotional in nature

(Green and Weaver, 1990). There is an obvious shortage of research focusing on the process of making the decision to select/not select cook-chill production as opposed to conventional, convenience, or cook-freeze production processes. For this reason this research study is focused on the development and testing of a model to determine the most effective decision strategy for this complex, multicriteria decision of selecting cook-chill as the production system for hospital foodservice operations.

CHAPTER II

REVIEW OF RELATED LITERATURE

This review of literature has been organized into the following topics:

1) decision making, decision making processes, and decision models
2) decision making in foodservice literature
3) Delphi technique

Decision Making, Decision Making Processes, and Decision Models

A decision is defined as a specific commitment to actions which often involves a commitment of resources (Mintzberg et al. 1976). Decision making can be a complex process involving many variables. Decision models, based on decision theories, organize and simplify decision making by acting as lenses that permit selected information to enter into the decision process (Hill, Bedeau, Chechile, Crochetiere, Kellerman, Ounjian, Pauker, Pauker, and Rubin, 1978). Both decision theories and models have been developed to apply methods of problem solving when a course of action must be chosen from alternatives in pursuit of organizational goals (Murray, 1986). Models may be derived from abstract concepts, but may manifest objective content. Value based assumptions, based on personal biases, needs, and background of the decision maker, are obviously found in models due to the abstract and subjective nature of the decision maker using the model (Murray, 1986).

Decision Making

Literature on decision making has been focused on the decision product as opposed to the decision process (Berger, Ferguson, and Woods, 1987). Although the product or outcome of the decision is important, a bias toward forecasting an optimistic outcome and

lack of systematic planning often results in a less than desirable outcome (Schnaars, 1989). Most business decisions have an element of uncertainty, therefore, decisions must often be made before the uncertainty is resolved (Hill et al. 1978) . Although good decisions tend to be those that evolve from a proper analysis of all information available to the decision maker, decisions are often confounded by the uncertainty from the environment and of future events (Hill et al. 1978).

Characteristics of Decision Making

Mintzberg et al. (1976) studied twenty five decision processes. Most of the decisions involved a new venture, product, service, facility, or equipment. The decisions studied were similar in that each process was novel, complex, and open-ended. According to Mintzberg et al. (1976), most decision making processes begin with little understanding of the decision situation and process. Typically there is only a vague notion of what the solution might be and how it will eventually be evaluated (Mintzberg et al. 1976). Decisions can be categorized on the basis of:

(1) stimuli for the decision

(2) potential solutions for the decision

(3) processes used to arrive at the decision

The stimuli for the decision can be an opportunity, a problem, or a crises. An opportunity decision is one that is initiated on a purely voluntary basis. A crisis decision is one that must be made in response to intense pressures. A problem decision is one that falls between the crisis and opportunity decisions. Potential solutions to decisions can be fully developed at the onset of the decision process, ready-made or fully developed in the environment during the process, custom-made especially for the decision, or it can be a modified solution which is a combination of a ready made and a custom made.

Vroom and Jago (1974) developed a formal model to analyze specific decision situations and to determine the decision making approach that has the highest probability

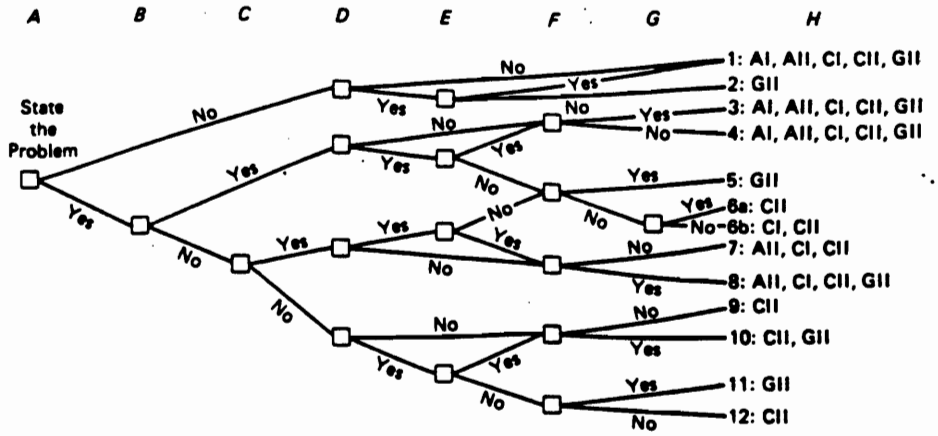
of effectiveness. This method consists of eight questions for managers to ask about the decision process (Figure 11). Vroom's model assumes the decisions will occur sequentially. The format of the model is a decision tree through which one moves by providing answers to each appropriate question.

Nonprogrammed Decisions

According to Mintzberg et al. (1976), most research has paid little attention to the nonprogrammed, multicriteria, strategic decision and more attention to the easily quantifiable, more precise programmed decision. Programmed decisions are described as routine decisions for which there is a ready solution. Nonprogrammed, nonroutine decisions present an ill-structured novel problem to which there is not a routine or clear cut solution (Simon, 1965). Although the focus of this research will be on the nonprogrammed decision making process, there may also be programmed decisions within the decision making process.

The traditional methods for dealing with nonprogrammmed decisions are judgment, intuition, creativity, rule of thumb, and careful selection and training of managers. A study of the decision making practices of a group of selected foodservice administrators revealed that most decisions are selected before the problem situation has been defined (Berger et al. 1987).

In complex decision making, the procedure includes: 1) outlining a few policy alternatives, 2) comparing the alternatives relying heavily on past experiences, and 3) making a final selection of alternatives. The complex process focuses on the marginal or incremental difference in the alternatives. In other words, the process does not analyze, but rather evaluates the differences (Lindblom, 1959). This procedure is frequently used by public agencies and relies on the branch method and/or the root method. The branch method evolves decisions out of current situations while the root method starts anew from the ground up each time, builds on past experience, and embodies a theory



A. Is there a quality requirement such that one solution is likely to be more rational than another?

B. Do I have sufficient information to make a high quality decision?

C . Is the problem structured?

D. Is acceptance of decision by subordinates critical to effective implementation?

E. If I were to make the decison by myself, is it reasonably certain that it would be accepted by my subordinates?

F. Do subordinates share the organizational goals to be attained in solving this problem?

G. Is conflict among subordinates likely in preferred solutions?

H. Do subordinates have sufficient information to make a high quality decision?

FIGURE 11 Vroom's Decision Flow Chart for Decision Making

Note. From " Leadership revisited." by V.H. Vroom in E.L. Case and F.G. Zimmer (eds.) Man and Work in Society p. 221-223. 1975, New York: Van Nostrand Reinhold.

(Lindblom, 1959). In 1965 Simon predicted th future method of dealing with nonprogrammed decision would be to train decision makers and to construct computer decision programs. More models have been developed for decision of lower and middle level managers than for upper level managers due the nature of the decisions within the hierarchy of the organization.

Programmed Decisions.

Researchers of decision making have formalizated routine decision making and have left the process of complex decision making to chance (Lindblom, 1959). In routine decision making the procedures include 1) listing all related values of importance, 2) lisiting all possible outcomes, 3) rating values as more or less efficient in maximizing outcome, and 4) systematically comparing alternatives. The strengths of this process are the clear objectives and the quantifiable values in the decision process.

Prescriptive versus Descriptive Decision Making.

Decision making may be categorized as descriptive or prescriptive. Descriptive decision making relates to the way decisions are actually made regardless of practicality, wisdom or efficiency. The focus with descriptive decision mkaing is not with the rational or ideal behavior, but with the actual behavior. Prescriptive decision making is concerned with the art and science of optimal decision making. A prescriptive decision model is an ideal model which incorporates a step by step procedure for making the decision. An example of a prescriptive decision model is demonstrated by Hill et. al (1978) in a series of six steps (Figure 12).

First the problem is defined by gathering information through environmental scanning. Thorough scanning leads to the second step which is the identification of alternatives, a limiting step which is a function of the perceptions of the decision maker(s). The process of making a list and weighing the relative importance of each

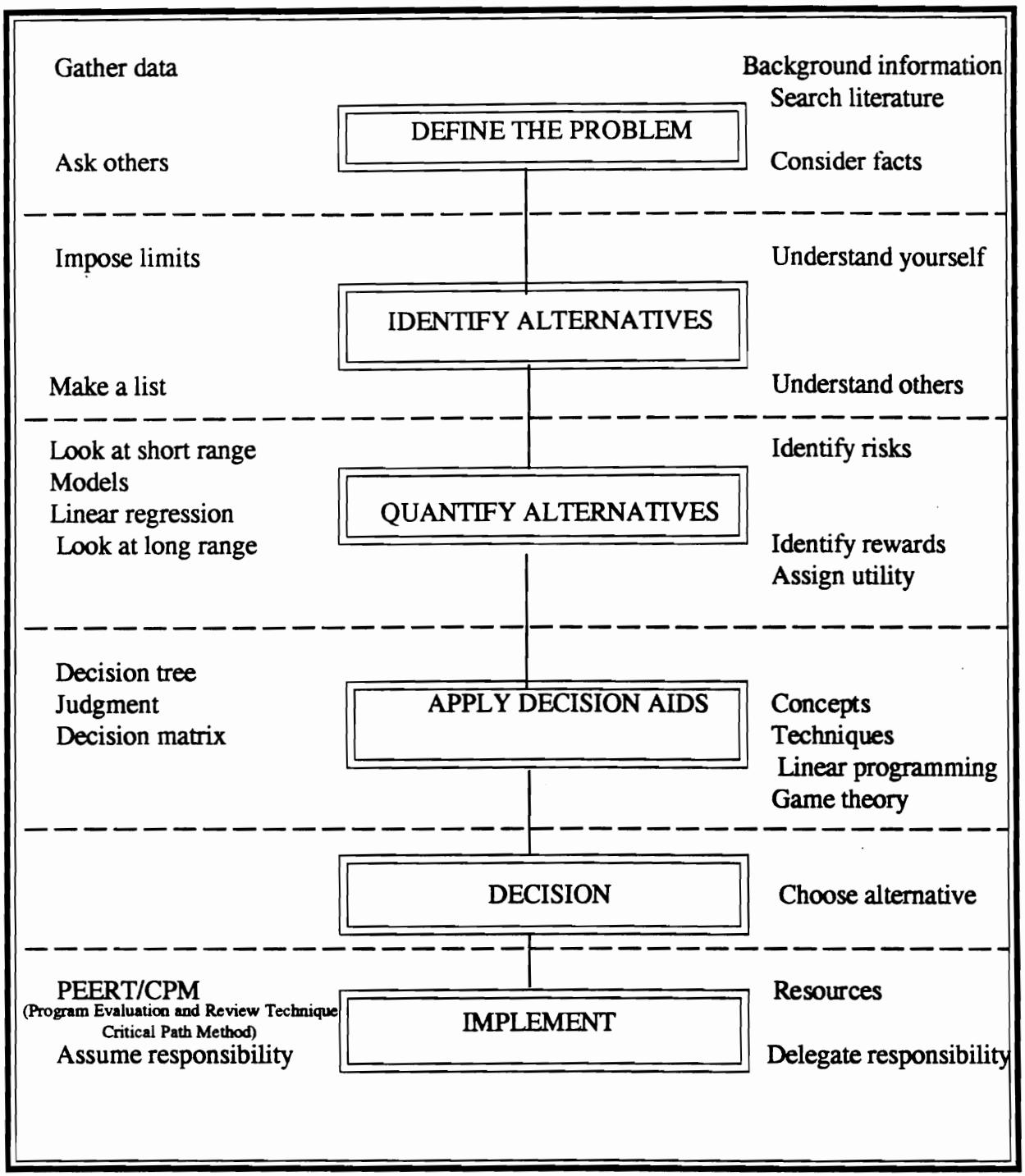


FIGURE 12 A Prescriptive Decision Model

Note. From Making Decisions - A Multidisciplinary Introduction. (p. 22) by P. H. Hill, H .A. Bedau, R. A. Chechile, W. J. Crochetiere, B. L. Kellerman, D. Ounjian, S. G. S. G. Pauker, S. P. Pauker, and J. Z. Rubin 1978. Reading Massachusetts: Addison-Wesley Publishing Company. Copyright 1978 by authors.

alternative facilitates quantifying the alternatives. Elimination of those alternatives not deemed important incorporates the use of a personal value system or personal utility. The fourth step requires the use of decision aids, which are mathematical techniques (such as decision matrixes, linear programming, game theory, linear regression, mathematical modeling and forecasting) to aid in the decision making process. Use of decision aids requires that the decision maker precisely know the scope of the problem. Effective use of decision aids is limited by the skill, resourcefulness and insight of the decision makers. At this point in the decision process, many decision makers choose to use intuition or "gut feeling" rather than decision aids.

The decision itself is the culmination of the the process. Regardless of the care with which the decision process was carried through, this is the final point where the choice can be reversed. Once the decision is made, however, there is a tendency to "stick with it." In implementation, the final step, action is taken to make sure that the decision is carried out. This is a critical last step in the process because even the best decisions can fail due to lack of resources. It is important to keep in mind that the decision process is a dynamic, iterating process. Feedback to make modifications and adjustments as the process evolves assures that the best decision was made.

Frequently the ideal prescriptive model must be abandoned for a descriptive model because other variables, such as the personality of the decision maker, psychological considerations, subjective utilities of the decision makers, and ethical norms have entered into the decision process. In the decision making process, both descriptive and prescriptive procedures may be considered in the final decision (Hill et al. 1978).

Analytical versus Intuitive Decision Making

Although good decisions tend to be those that evolve from a proper analysis of all information available to the decision maker, decisions are often confounded by the uncertainty of the environment and future events. A caveat to this premise is that good decisions should not be confused with good outcomes (Ferguson and Selling, 1985). Environmental uncertainty in the hospitality industry is a variable that makes forecasting a difficult yet critical factor in decision making. According to Berger et al. (1987), foodservice managers/administrators have typically used personal intuition and staff feedback as opposed to financial statements or regular operational analyses to evaluate the viability of a decision with regard to the foodservice organization.

Although there has been an increased sophistication and refinement in multicriteria decision making methods (MCDM), to include decision matrix, linear programming, game theory, linear regression, mathematical modeling, and forecasting, evidence reveals that most decision makers prefer the relatively unsophisticated methods of decision making such as intuition. (Kottemann and Davis, 1991; Hill et al. 1978). The availability of precise information is a prerequisite for the use of all decision aids, therefore, the usefulness of these aides is limited by the information and the insight of the decision maker. Many critical decisions in both business and government have been based on "gut feel," snap judgement, impulse, advice from the "experts," or a "toss of the coin" (Hill et al. 1978).

Kottemann and Davis (1991) argued that preference for these unsophisticated methods is a function of the level of decision conflict introduced by use of MCDM. The key mechanisms upon which they base their argument are: 1) the effect of response mode on the decision making strategy, 2) the effect of the decision making strategy on the salience of the decisional conflict, and 3) the effect of decisional conflict on decision maker attitudes. They also found that satisfaction with ad hoc decisions initially gener-

ated by a decision maker was higher than decisions generated by multicriteria decision making aids.

Kottemann and David (1991) contend that decision makers employ a variety of strategies when confronted with a decision. These strategies can be categorized as compensatory and noncompensatory. A noncompensatory strategy uses elimination by aspect of rules to arrive at a final decision. Compensatory strategies, however, involve explicit assessment of tradeoffs and therefore, have been found to introduce greater decisional stress. In order to avoid decisional stress, the decison maker will seek a more simple strategy which is often intuition or "gut feeling.

Satisfaction: Goal Achievement.

A decision is defined as a specific commitment to action which often involves a commitment of resources (Mintzberg et al. 1976). Decision making can, therefore, be defined as the "process by which courses of action are chosen from alternatives in pursuit of organizational goals" (Murray, 1986). Each individual enters the decision process with certain goals or expectations. A decision maker's success in achieving the goals or expectations determines his level of satisfaction with the decision. An individual's expectation of achievement in the process of solving problems is defined as their aspiration level (Berg, 1986). The level of expectation will determine the level of satisfaction with achieving a goal. Aspiration level constantly adjusts to changing environmental conditions (Berg, 1986). Because organizations are complex structures, their goals and aspirations are numerous and may be categorized as financial, legal, political, or social (Murray, 1986). Etzioni, in his classic study, wrote that goals are integral aspects of organizational life in that they provide: 1) a source of legitimacy to justify the existence and actions of the organization and 2) a standard by which to assess the success of the organization (in Murray, 1986).

Strategy, Structure, and Culture

Strategy and decision making.

The ability of a decision maker to make a decision is dependent on the organization strategy, structure, and culture, therefore, understanding the relationship between these constructs is a a prerequisite for an understanding their impact on decision making. Strategy is defined as the "current set of plans, decisions, and objectives that have been adopted to achieve the organization's goals" (Daft, 1989). "Strategy is the basis of a firm's decision making process on issues ranging from market position to personnel policies" (Nanus and Lundberg 1988). The formulation of an organizational strategy begins with an assessment of the opportunities and threats in the external environment (Tse, 1989).

Porter's (1980) topology of "Forces in the Environment" (Figure 13) depicts the factors in the environment that have an impact on the strategy and structure of the organization: 1) the bargaining power of the buyers, 2) the threat of new entrants into the market, 3) the bargaining power of the suppliers, and 4) the threat of substitute products or services. Decision maker(s) have been defined as those people who are given choices. The ability of decision makers to scan and interpret the impact of environmental forces is a function of their level in the organization, educational background, and level of perceptiveness and the competitive strategy of the organization (Snow, 1976; Child, 1972; Slattery and Olsen, 1984; Aguilar, 1967)

Strategy formulation occurs at corporate, business, and functional levels. Corporate level strategic issues include the overall business portfolio, acquisitions, divestments, joint ventures, and major reorganizations. Business level strategic issues include advertising, research and development, product changes, new facilities and locations, and expansion of product lines. Functional level strategic issues guide key functional areas of

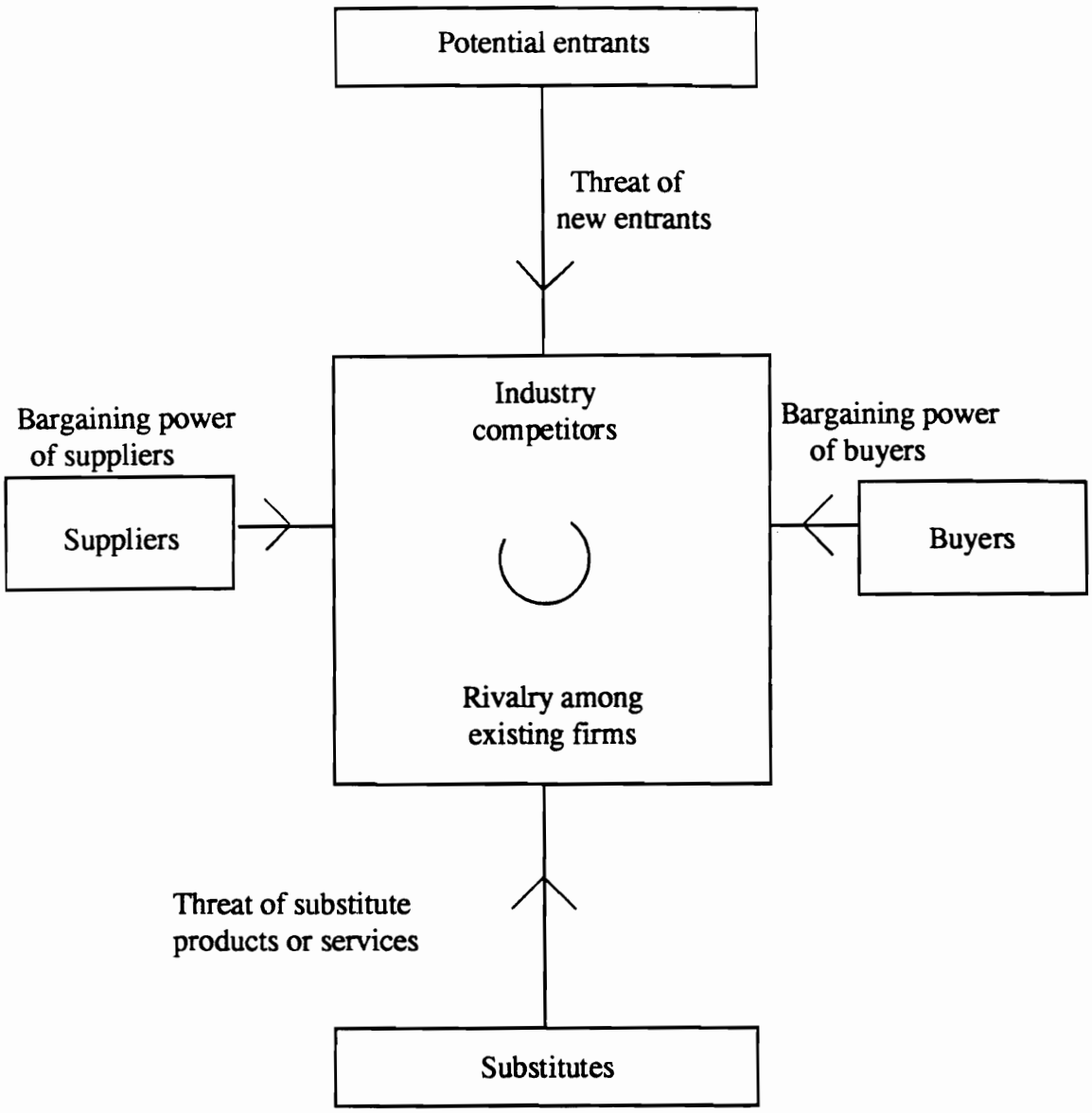


FIGURE 13 Porter's Typology of Forces in the Environment

Note. From Strategic Management Strategy Formulation and Implementation (p. 126) by J. A. Pearce II and R. B. Robinson, Jr, 1988, Homewood, IL: Richard D. Irwin, Inc. Copyright 1988.

the company in implementing the corporate strategy. The primary strategic question at the business and functional levels is "how do we compete?"

Miles and Snow (1978) developed a topology of business level strategies which characterize the way in which administrators interpret and respond to the environment as: defenders, prospectors, analyzers, and reactors. The three proactive strategies fall on a continuum with defenders and prospectors on opposite extremes with analyzers between. Reactors are a strategic "failure" in that they fail to respond in a consistently timely fashion. Defenders maintain a stable organizational form and assure security through market penetration with a high priority on efficient production. The primary risk of the defender is being unable to respond quickly to major market shifts. The prospector, often called the innovator, is the opposite of the defender. The nature of the prospector is more dynamic and focused on finding and exploiting new opportunities in the market. The prospector's affinity for change provides a competitive edge over competitors. An organization that would assume a prospector strategy would obviously need to be more organic than mechanistic in nature (Burns and Stalker, 1961). The analyzer, a unique combination of the prospector and defender, attempts to maximize the opportunity for profit while minimizing the risk. The challenge of this "balancing" strategy is to identify and develop new markets while still maintaining the core of traditional products and customers.

In the process of making a decision, the decision maker characteristically assumes a strategy based on how informally or formally he/she structures the decision problem through the assignment of probabilities and utilities (Keeney and Raiffa, 1976). Because many complex decisions are multicriteria, it is common to discover conflicting objectives. Simultaneous maximization of several objectives is often an impossibility, therefore, tradeoffs must be made. Uncertainty necessitates the use of personal values to determine the tradeoffs (Keeney and Raiffa, 1976). If the decision is made under certain conditions, tradeoffs are not required.

Structure and decision making.

Structure in the form of complexity, formalization, centralization, and administrative intensity of an organization will have an impact on decision making in the organization (Ford and Slocum, 1977). The development of a truly integrated flow of information for the decision making process requires a highly adaptive organizational structure which is organic and opposed to mechanistic (Burns and Stalker, 1961). Decentralization and the flattening of the organizational structure through the elimination of layers of hierarchy enhances the flow of information and consequently the timely availability of information at decision points (Hough, 1970).

Culture and decision making.

Culture, a set of commonly held beliefs, is defined as a "set of key values, guiding beliefs, and understandings that are shared by members of the organization" (Daft, 1989). The two central roles of culture within an organization are 1) to provide a way of understanding and making sense of events and symbols and 2) to embody a set of values that will help justify why certain behavior is encouraged to the exclusion of other behavior (Tichy and Ulrich, 1984). The culture of an organization affects the decision making process by assuring a greater likelihood of agreement with regard to the priorities that should take precedence when making choices in decisions (Pearce and Robinson, 1988)

Decision Making Processes

The Study of Decision Processes

The procedures used in the study of decision processes are observation, examination of organizational records, and the interview or questionnaire. Observation is not only a reliable, but also a powerful method of studying the decision process. It is limited, however, by the time it takes to make a decision which can be from months to years. Examination of organizational records is time consuming, may not provide complete

information and is not always available. Interview/questionnaire becomes a viable method because of the time factors in decision making. The best record of the decision process is in the minds of those who made the decision (Mintzberg et al. 1976). To control for memory errors such as distortion and memory failure, multiple interviewing is recommended.

The effectiveness of the decision can be measured by the 1) quality or rationality of the decision, 2) acceptance or commitment of subordinates in carrying out the decision effectively, and 3) amount of time required to make the decision (Kolb, Rubin and Osland, 1991). The importance of each of these effectiveness measures will vary with the type of decision to be made. For example, acceptance or commitment of subordinates is not as critical in a decision where the decision maker will be the person to implement the decision. No single effectiveness measure is designed for all decisions or subdecisions.

Categories of Decision Research

According to Mintzberg et al. (1976) empirically based literature on decision making can be grouped into three research categories: 1) individual decision making by cognitive psychologists, 2) group decision making by social psychologists, and 3) organizational decision making by management theorists and political scientists.

Individual decision making by cognitive psychologists.

Research on individual decision making reveals that the goal of the individual when faced with a complex, unprogrammed decision is to reduce the decision into subdecisions. These subdecisions are factored into smaller more familiar procedures. Individuals are more likely to use satisficing shortcuts to reduce the complex environment as opposed to maximizing the solution to the decision making process. Often the

conclusion in individual decision making is that the decision processes are programmable when, in fact, they are not.

An individual's decision style is based on use of information and cognitive makeup (Nutt, 1986, 1989). Most measures of cognitive style have been found to lack validity (Taylor and Benbasat, 1980). The Meyers-Briggs Type Indicators (MBTI), however, have been found to be an exception. McKenney and Keen (1974), Driver and Mock (1975), Bieri (1961), and Hudson (1966) have provided evidence that supports the conceptual construct and predictability of MBTI.

Jung's theory of psychological types provides the basis for the MBTI. Cognitive style research traditionally uses two dimensions of gathering information: sensing or intuition. Sensing individuals are more analytical and prefer hard data that deals in specifics. A clearly sensing individual seeks to know objective, quantitative information. The intuitive individual, on the other hand, looks for more holistic information which is typically qualitative and subjective in nature. An intuitive person looks for the possibilities of what might be. In decision making both sensing and intuitive information is used. Individuals develop preferences for one of these information gathering types over the other. Jungian theory defines these data types as ST (sensing-thinking), NT (sensing-thinking), SF (sensation-feeling), and NF (intuition-feeling). These data types in an applied situation are termed decision styles.

Group decision making by social psychologists.

Social psychologists have provided the bulk of research on group decision making. The focus has been not so much on the decision as such, but more on the interaction between members of the group. Much of the research in this area has been in the laboratory which removes the decision process from the impact of important environmental factors.

Organizational decision making by management theorists and political scientists.

Organizational decision making is the process by which courses of action are chosen in the pursuit of organizational goals (Murray, 1986). Several frameworks of decision making have been proposed by researchers. As long ago as 1910, Dewey (1933) suggested the five phases of reflective thought: 1) suggestive thought, 2) intellectualization, 3) hypothesis development, 4) reasoning and elaboration, and 5) testing of the hypothesis. Research on organization decision making began in the mid 1950s with the work by Cyert and March (1963) and Simon (1965) which stimulated insightful follow-up studies.

The most well known framework is Simon's (1965) decision making trichotomy. He envisioned decision making as a three phase process: intelligence, design, and choice. Borrowing from the military, Simon labelled the search of the environment for a situation calling for a decision as intelligence activity. In the second phase, design is defined as inventing, developing, and analyzing possible courses of action. The third phase is selection of a particular course of action.

Witte (1972) was concerned with the issue of whether distinct phases existed in the decision process and whether these phases followed a simple sequence, as many other researchers have suggested. In a study of 233 decision processes, Witte (1972) found that there was no relationship between the sequencing of the phases and the efficiency of the final decision. He did find the decision process to be composed of a plurality of subdecisions.

The need for making a strategic decision is not always presented a clearly and conveniently. An individual may perceive the need for a decision based on a flow of largely ambiguous verbal data (Sayles, 1964; Mintzberg et al. 1976). Need for a decision is a function of the differential between an actual situation and an established standard for

the situation. According to Pounds (1969) standards are set on the basis of past trends and projected trends.

Decision Making Models

In the examination of decision models, Murray suggests that there are three primary intellectual approaches, or truth seeking methods, in making decisions: the rational approach (comprehensive), the political approach (incremental), and the legal approach (discretionary) (Lindblom, 1959). Rational models are decision making process based on scientific, sequential, systematic means and ends analysis. The process whereby programs are derived from an analysis of causation and change. These models require that the goals be known before the courses of action are proposed (Murray, 1986). In a rational model, the process involves selection of a choice based upon real or perceived preferences based on currently available information (Murray, 1986).
Political models are decision making processes based on vaguely formulated and simple goals that are matched with a few policy alternatives; the result being an unclear, partially satisficing decision (Murray, 1986). Lindblom (1959) differentiated political from rational decision making in that the political decision maker must use vaguely formulated and simple goals in a fragmented fashion with few policy alternatives. The "garbage can model" of decision making, a type of political model developed by March and Weissinger-Baylon (1985), is basically a set of ideas about decision making in uncertain or ambiguous environments. The garbage can model is a transitional model from the clear objectives and choices of rational decision making to the muddled, conflicting objectives and compromised choices of the political decision model (Murray, 1986).

The legal or discretionary model is based on the rule of law and relies on factual premises, statutes and regulation. The discretionary nature of the legal model includes

the justice ethic, the test of balance, and ambiguity as a goal. The test of an effective legal model is whether it is ambiguous enough to allow for selective application. The legal model, unlike the rational model, does not seek to evaluate all potential consequences as favorable and unfavorable.

Mintzberg's General Model of the Strategic Decision Process

Mintzberg et al. (1976) supported the logic of Witte by stating that there are distinct phases in decision making and there does not appear to be a distinctly sequential relationship between the phases. It is Mintzberg's contention that there are three distinct sets of routines that support the central theme of decision making: identification-development-selection (Figure 14).

Recognition/identification routine.

During the recognition/identification routine, the differences between opportunity, problem, and crisis decision are clear. One characteristic of the recognition routine is the tendency of decision makers to be reluctant to act on a problem for which they see no clear solution. The greatest likelihood of recognition occurs when there is a problem and a clear solution or opportunity to solve it.

The moment of action on a problem situation is a function of the perceptions of the decision maker and answers to the following:

1) number of factors stimulated the decision
2) level of interest of the decision maker
3) perceived payoff
4) perceived probability of successful termination of the decision

The threshold level of the manager has also been found to have an impact on decisions. Radomsky (1967) found that a "manager's threshold shifts continually according to workload and number and types of decision process in his active inventory.

Diagnosis routine.

Once the number of stimuli have reached the threshold level of the decision maker, the decision process is begun and resources are mobilized. The dilemma for the decision maker at this point is how to manage partial data in a unique situation. A variety of procedures have been recommended for decision making. Having the need to make decision, but not having access to the necessary information is a primary problem in decision making (Ferguson and Selling, 1985). Clearly, the next step in the decision making process is the search for existing information and developing new channels of information to assist in the definition of the issue at hand. Environmental scanning is a process that may occur at this stage.

Substantive discussion of the diagnosis routine in the decision making process is almost non existent in descriptive and normative literature (Mintzberg et al. 1976). A few exceptions to this statement are the research of Bonge (1972), Emory and Niland (1966), and Drucker (1971). Drucker has pointed out that careful attention to the diagnosis is one factor that characterizes Japanese from American decision makers. Diagnosis can take the form of an investigating committee, task force, or a consultant. Diagnoses are more likely to occur in problem or crisis situations and less likely to occur in opportunity decisions.

Development phase.

The greatest amount of resources are required in the development phase where two routines occur: search and design. In the search routine, the objective is to find ready-made solutions. In the design routine, however, the objective is to use custom-made solutions or modify ready-made ones.

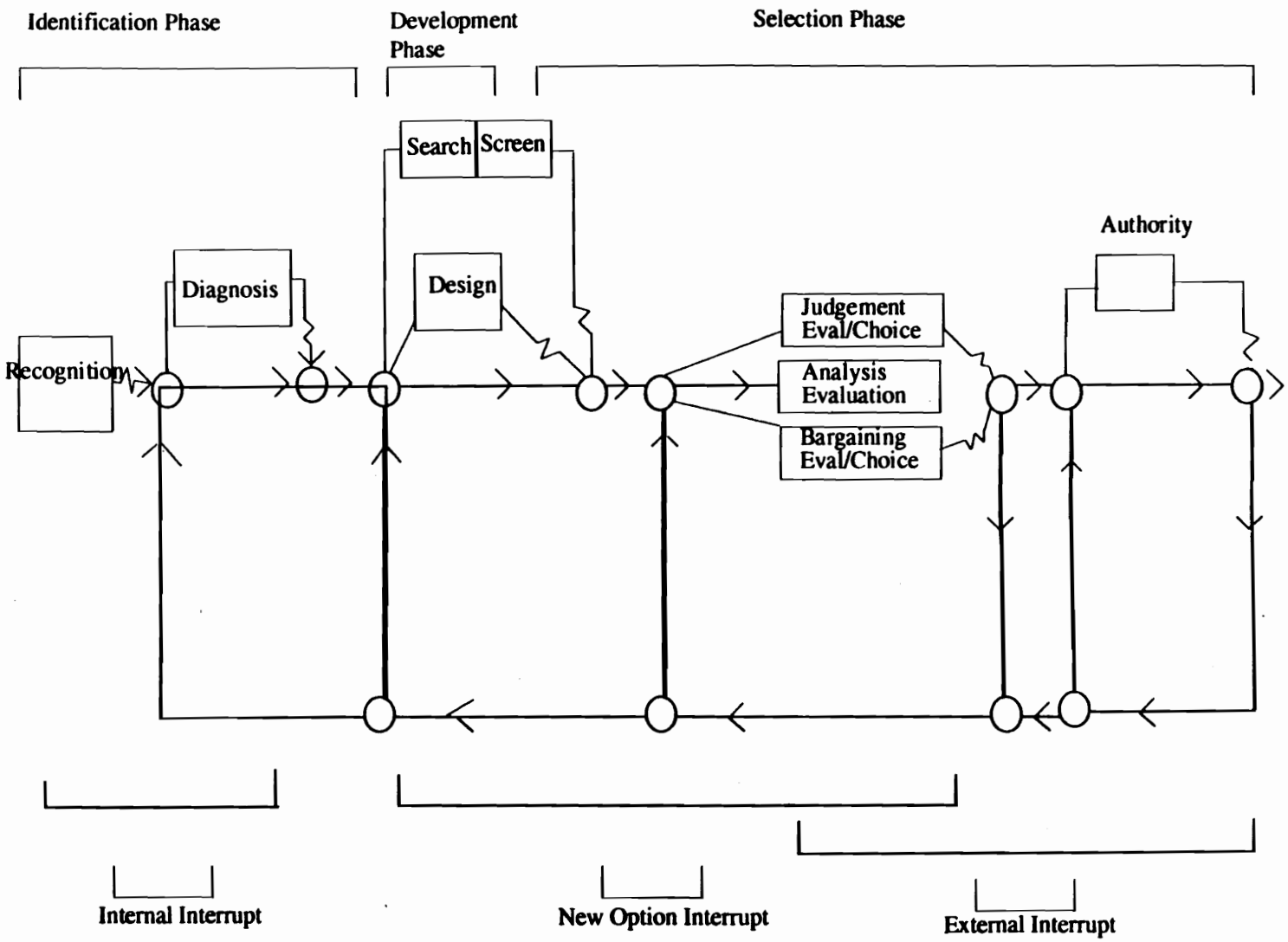


FIGURE 14
Mintzberg's General Model of the Strategic Decision Process

The search routine may be by memory search, passive search, trap search, or active search. Memory search is the scanning of the organizations existing memory. Passive search would refer to those alternative solutions that just appear. Trap search involves the use of "search generators" to produce alternatives. Active search is direct seeking of alternatives through scanning. The search process is often hierarchical and stepwise in process (Mintzberg et al. 1976).

Selection phase.

The selection phase is the last step in the decision process and involves the factoring of one decision into a series of decisions. Selection has also been described as a multi-iterative process in which alternatives are examined in more depth. Normative literature describes the selection process as three routines:

1) determination of the criteria for choice,

2) evaluation of the consequences of the alternatives, and

3) selection of the choice.

In reality these routines follow the process of screen, evaluation-choice, and authorization (Mintzberg et al. 1976). The screening routine (Cyert and March, 1963; Cyert and MacCrimmon, 1968; and Soelberg, 1967) involves the elimination of alternatives that are considered infeasible and determination of what is appropriate. The evaluation-choice has received a vast amount of attention in the literature. The primary modes that occur here are judgment, bargaining, and analysis. In judgment, one person makes a choice. In bargaining, a choice is made among a group of decision makers who may have conflicting goals. In analysis, a factual evaluation is carried out. The fact that most of the strategic alternatives in decision processes are "soft" or nonquantitative makes the evaluation-choice routine a crude one. Evaluation choice may get "distorted" by information overload (cognitive limitations) and unintended biases.

Authorization routine.

After a final evaluation and /or choice, the authorization routine begins. Authorization is necessary when the person making the decision does not have the authority to commit to a course of action for the organization. The routine usually moves up the organization hierarchy and may also move to people outside the immediate organization who have the power to block the decision. Acceptance or rejection may occur at any level. Acceptance allows the decision to move on up the hierarchy while rejection may precede total abandonment or redevelopment of the project.

The authorization routine may present a less than desirable situation in that the time for evaluation of the decision is limited. The decision must also be considered in view of other strategic decisions of the organization. Outside political forces may have a major impact on the authorizer who usually lacks the in-depth knowledge of the project. The shortcomings and biases of the manager are compounded by the lack of knowledge and political environment of the authorizer.

Dynamic factors.

Dynamic factors that serve to interrupt the progress from one routine to another in the decision process are typical of an open system that is subject to interferences. The impact of dynamic factors on the processes are to delay, stop, and restart. There are seven groups of dynamic factors: 1)interrupts from environmental forces, 2) scheduling delays, 3) timing delays, 4) speedups which are affected by the decision makers, 5) feedback delays, 6) comprehension cycles, and 7) failure recycles which are inherent characteristics of the cycles.

Decision Making in Foodservice Literature

The review of literature for decision making in foodservice literature is limited by a variety of factors:

1) the lack of research in foodservice systems (Light and Walker, 1991; Green and Weaver, 1990)

2) the fact that the majority of articles written were promotional or descriptive case studies

3) the tendency of few articles written to focus on the decision as opposed to the decision making process in the selection of cook-chill production.

Research by Light and Walker (1991), Spears (1976), and Koncel (1976, 1977) provided the framework for this research on the decision making process in the selection of cook-chill. Freshwater (1980), Greathouse and Gregorie (1988), Greathouse et al. (1989) and Herz and Souder (1977) have also contributed to the body of knowledge, however, their research efforts have primarily focused on a comparison of cook-chill to the other foodservice production processes as opposed to the nature of the decision process in the selection of cook-chill.

Light and Walker's Extensive Cook-chill Survey in the United Kingdom

Although cook-chill food production is practiced worldwide, there has been little research done on its use in most countries. The most extensive research done on cook-chill to date was conducted by Light and Walker (1991) in the United Kingdom. In 1985, Light and Walker surveyed 80 cook-chill operations to find that the introduction of cook-chill is problematic as opposed to simple. In addition, introduction of cook-chill required a more systematic approach to production since it required a modification of work patterns of the entire organization.

Light and Walker (1991) extensively surveyed decision makers, cook-chill operators, and consumers of cook-chill foods in 80 of the 240 existing cook-chill operations in England. The purpose of this in-depth study was to gather subjective (attitudes and opinions) as well as objective (factual) data. The three types of questionnaires used were: personal interview with foodservice manager, covert interviewing and observation of cook-chill operators, and customer satisfaction survey. Light and Walker (1991) developed a model for the implementation of cook-chill (Figure15). Although all factors in the implementation of cook-chill technology are considered in the model, the respective correlations or weights were not evaluated. Specifically the success of a cook-chill foodservice was operationalized: functionally, socially and technically. Success, according to Light and Walker (1991) was determined by level of usage, effectiveness of utilization, achievement of aims, actual temperature and waste control, financial efficiency, customer and employee satisfaction, and the extent to which pre-existing problems with cook-chill were overcome.

The human element was found to be critical in the change to cook-chill. In the sample, 56% reported the reason for switching to cook-chill was to reduce costs although most reports of cost savings are supported by little concrete evidence in the literature (Light and Walker, 1991). Cost savings evidence is weak due to the lack of accurate financial statements and to the problem in separating actual costs associated with the cook-chill system from the remainder of the organization. With regard to operations, Light and Walker (1991) found that pre-installation recipe development did not necessarily mean that recipe problems would not exist after cook-chill installation.

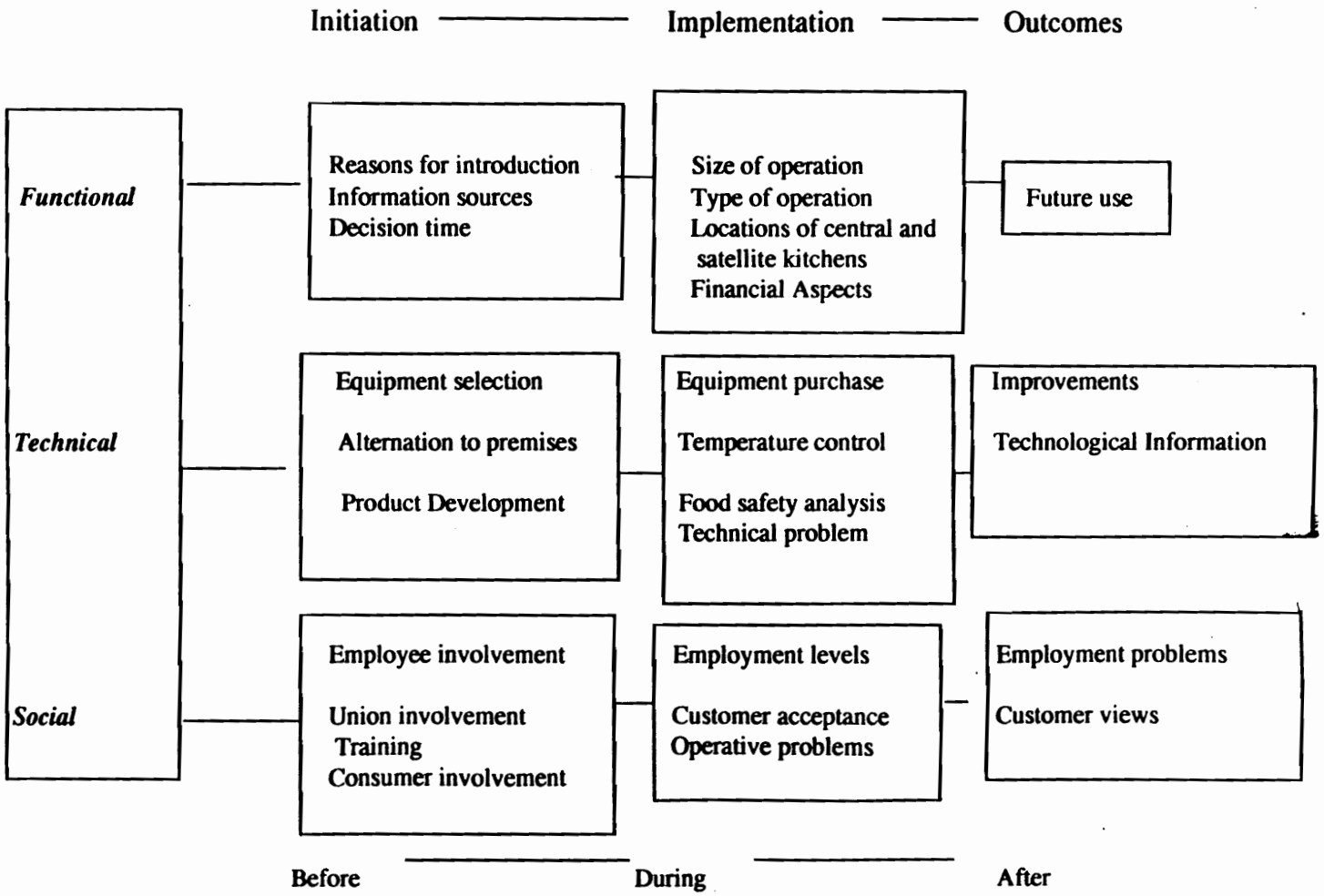


FIGURE 15 Light and Walker's Key Factors in the Implementation of Cook-chill Technology

Light and Walker (1991) identified ten key issues in setting up and running a successful cook-chill foodservice:

1) Awareness and compliance with approved guidelines
2) Awareness of need for and operation of proper quality control
3) Relevant training of all staff
4) Employment stability in managers and decision makers
5) Control of time and temperature
6) Perception of real need to introduce system
7) Development of ongoing research and development program
8) Adequate capital expenditure
9) Effective communication with customers and staff in feasibility study and installation
10) Use of many sources of information in the feasibility study.

Although the work of Light and Walker (1991) was in depth, their sample was limited in that only 14% of those cook-chill operations surveyed were in hospitals while 48% (38) were in industrial plant foodservices. The remainder of the cook-chill operations in the sample were in hotels, leisure spots, schools, and welfare programs. Most of the evidence presented by Light and Walker (1991) is taken from the U.K. Cook-chill Survey, data from other research projects, and anecdotal case studies. The environment of hospital foodservices in the U.K. National Health Service is uniquely different than those in the U.S. Recently, a U.K. government policy that placed ancillary services (cleaning, foodservice, laundry, etc.) out to competitive subcontracts caused a concerted effort among foodservice managers to seek cost effective ways to keep the foodservices in house. Another feature of the U.K. National Health Service is that decision making occurs at the regional level with little input from each individual hospital regarding its special needs.

In the textbook written by Light and Walker (1991) the results of the survey were reported as descriptive data opposed to correlational. Of the factors presented, the relative importance of one factor over another was not reported. Although it was their hypothesis that the activities of a successful cook-chill unit would differ from that of an unsuccessful unit at all phases of the change process, they did not quantify nor prove their points. It was Light and Walker's (1991) conclusion that the activities in the planning stage "sow the seeds for the eventual success or failure of cook-chill." They failed to statistically defend their opinions with any method stronger than the report of descriptive data. It is the purpose of this researcher's study to develop a model of the decision process in the selection of cook-chill and test the statistical significance of the model.

Spear's Model for the Decision to Select a Food Production Process

In 1976 Spears addressed the issue of accountability of hospital foodservices in the decision making. Her hypothetical example of the decision making process focused on the use of 100% conventional production process versus conventional and partial convenience. She labeled the decision process as "structure of choice" from desired objective to final choice. It was her contention that the structure of choice involved four steps (Figure 16) 1) determining the objective, 2) proposing alternatives, 3) ranking alternatives, and 4) selecting alternatives. In Step 2, the use of a model and cost benefit comparison would require that precise quantitative information be available. Subjectivity is introduced in Step 3 when alternatives are ranked according to desirability. Spears concluded that effectiveness was an elusive construct and that there was a need for new measures of effectiveness to be devised, tested, and refined. In addition, she stated that any evaluation that focused on attainment of objectives without consideration of costs was as faulty an evaluation that focused on cost to the exclusion of other objectives. The balance between cost and effectiveness, though ill defined, is critical to the success of a decision.

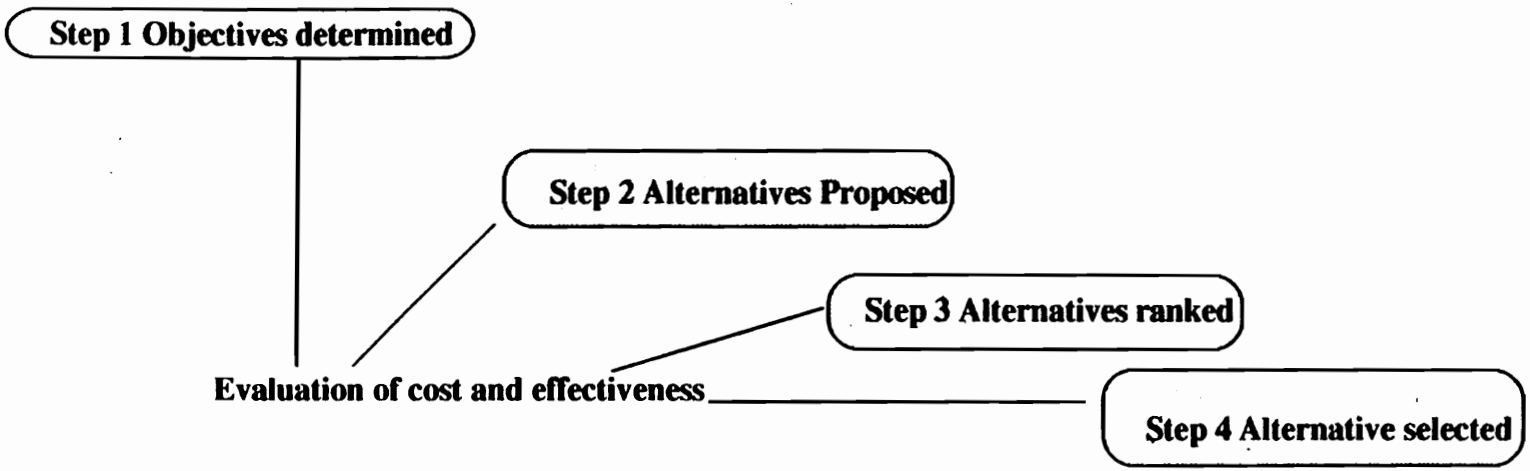


FIGURE 16 Spear's "Structure of Choice" in Decision Making

Koncel's Case Study of An Actual Decision and Implementation of Cook-chill

Koncel (1976) examined the process of making the decision to select a food production process for a new medical facility for Good Samaritan Hospital in Dayton, Ohio. The decision process included the use of a dietary planning committee which consisted of six hospital personnel: director and assistant director of dietary services, the chief clinical dietitian, the food production manager, the patient tray assembly dietitian, and the assistant vice president of hospital administration. This decision making process included an adjustment due to negative feedback from the originial prototype convenience food production process.

After reviewing alternatives, the dietary planning committee made recommendations to the foodservice to implement a program using convenience foods and disposable service. The foodservice established a prototype unit serving 32 to 35 patients to test the new concept. After one year of operation, the prototype was discontinued due to the expense of operation, inconsistency in the delivery of high quality meals, and poor patient acceptance. The dietary planning committee reevaluated the alternatives and revised their recommendations. The second recommendation included cook-chill production in combination with convenience foods that met quality standards. This process provided an example of the value of feedback and testing prior to complete implementation of a new technology.

The planning for cook-chill included the plan for floor pantries, the selection of a cart delivery system, the renovation and remodeling of the kitchen, the revision of staffing and scheduling guidelines, development of in-service training for the use of cook-chill/ convenience food production process, the development of a procedure manual, the testing of new recipes for production by cook-chill and reheating by micro-

wave ovens. Good Samaritan Hospital was satisfied with the conversion to cook-chill/ convenience due to the more evenly organized foodservice and elimination of peak hour crises in service. Implementation was not without problems, however. The extensive pre-planning helped to minimize but not totally eliminate problems associated with implementation of cook-chill.

In 1977 Koncel surveyed hospitals with greater than 100 beds to learn more about how decisions related to foodservice operations were made. He found that 82% of hospital administrators said they met regularly with the foodservice director to discuss the needs for new products and equipment. Although 57% of the final decisions in the selection of a foodservice system were made by the hospital administrator, the opinion of the foodservice director was also an important factor in the selection.

Greathouse and Gregoire's Evaluation of Demographic Variables as they Relate to the Selection of a Food Production Process

Although the conventional food production process is the type most prevalent in U.S. hospitals, Greathouse and Gregorie (1988) found that cook-chill was more likely to be the process of choice in large (450 bed or more) hospitals located in urban areas. Greathouse and Gregoire (1988) reported that the use of cook-chill has continued to increase since the first installation of the process in the U.S. during the 1960s.

In a follow up study in 1989 Greathouse et al. collected operational and financial data from conventional, cook-chill and cook-freeze hospital foodservices. Due to the difficulty in collecting financial data in a consistent format from the respective sample, they found it necessary to gather data from the Health Care Financing Administration which maintains cost records used by Medicare and Medicaid for reimbursement purposes. Greathouse et al. (1989) found there to be little difference in the financial data from the three types of production processes. Therefore, it was their conclusion that installation of cook-chill or cook-freeze does not necessarily lead to savings in cost.

Herz's Comparison of All Four Production Processes

Herz made a comparison of all four food production processes in 100 bed hospitals based on labor, food cost, supplies, energy, equipment, and space. In labor cost he included cost of personnel including fringe benefits for purchasing, receiving, storage, production, service, and sanitation. His calculation for food cost was based on standard menus in 1977. Energy costs included processing, freezing/chilling, and reheating. With regard to equipment he included the fixed cost of the equipment and space. Herz used payback as a method of determining when the expense of the investment would be paid off. An accurate comparison of the costs of the four processes was problematic since cost factors differed with increasing and decreasing volume and were therefore difficult to estimate.

Based on the limitations of existing research, the purpose of this study will be to focus specifically on cook-chill in healthcare operations, more specifically, hospital foodservices. The goal will be to examine the relationship between the decision strategy and satisfaction with cook-chill production. A generic decision model will be developed based on a review of decision making literature. The Delphi technique will be used to gather information on a topic that has not been empirically researched in the U.S. A review of the content of the Delphi panel members' responses will be used to indicate the relative importance of each of the factors in the decision to select cook chill. From the nature of and the ranking of the Delphi panel responses, it will be determined if the decision strategy in the selection of cook-chill is analytical or intuitive. A correlation will be drawn between the decision strategy and the level of success or satisfaction with cook-chill.

The Delphi Research Technique

The Delphi research technique of gathering opinions from experts on an issue was originally developed in 1950 by the Rand Corporation for the purpose of long-range forecasting. The primary approach in the Delphi is to seek group consensus based on information gathered in a series of questionnaires. The lack of face-to-face exposure permits anonymity of the participants (Tersine and Riggs, 1976). According to Linstone and Turoff (1975), the Delphi technique has been found to be of significant value in designing the structure for a model and compiling current and historical data not accurately recorded. This technique is justified in situations where personal status and the position of experts in a group may force group judgment as opposed to individual judgment (Weaver, 1971). Results of the Delphi method have been found to be particularly useful in making recommendations regarding the introduction of new products or technologies (Linstone and Turoff, 1975; Parten, 1950).

The Delphi technique is particularly appropriate when the following conditions apply:

1) the problem may not lend itself to analytical procedures, but can benefit from subjective collective opinions,
2) there is a need for more individuals to participate than can effectively meet face-to-face, and
3) the time and cost of frequent group meetings is prohibitive (Linstone and Turoff, 1975).

The first phase in the traditionally four phase Delphi technique involves exploration of a subject and collection of inputs from experts. The second phase requires that the researcher review the expert opinions to get an understanding on how the group of experts view the topic. In the third phase the Delphi experts get an opportunity to anony-

mously evaluate the input of the other experts and provide a final opinion to the researcher (Phase 4).

Two components which are critical for the success of the Delphi method are selection of participants and sample size. Tersine and Riggs (1976) have reported that although the number of questionnaires or rounds varies, it is considered that a minimum of three rounds are necessary to gain consensus. According to Tersine and Riggs (1976), there are five basic criteria in selecting participants:

1) basic knowledge of the problem area and ability to apply knowledge
2) good performance record in their area of focus
3) high degree of objectivity and rationality
4) time available to participate throughout process
5) willing to give the time necessary to do a thorough job

Although there are no specific guidelines for determining the optimal number of participants, a panel of 10 to 15 members has sufficed for producing effective results (Tersine and Riggs, 1976; Brady, 1988).

Several modifications of the Delphi have been made. Cross-impact analysis examines the impact of one event on another event. A second modification, system for event evaluation and review (SEER), eliminates the first round by constructing forecast statements prior to beginning the Delphi process thereby reducing the number of required rounds (Tersine and Riggs, 1976).

Summary of Review of Literature

Based on the review of related literature, it can be said that the decision to select/ not select cook-chill food production in hospital foodservices is a multicriteria, complex decision that is made in an environment of uncertainty. The lack of empirical research on cook-chill as well as other food production processes is problematic for the foodservice administrator. The purpose of this research will be to construct a model of the decision process with both descriptive and prescriptive components. The Delphi technique was selected as the research method because of its appropriateness for developing models and introduction of new technologies. This model will be a garbage can model in that it is neither clearly rational nor political, but a combination of both. This model will focus on the *process* of making the decision to select/not select cook-chill as opposed to the final decision. The generic nature of the model developed for the decision process to select/ not select cook-chill for hospital foodservices will permit the model to be used in any type of hospital regardless of its, size, location, financial and administrative structure. The purpose of the model is to guide and facilitate systematic planning and decision making in the selection of cook-chill production.

CHAPTER 3

METHODOLOGY

Objectives of Study

The methodology of this study is designed to fulfill the following objectives:

1. To develop a generic model for the decision process of selecting/not selecting cook-chill food production for hospital foodservices
2. To test the generic model for appropriateness and statistical significance for use in the decision process involved in selecting/not selecting cook-chill food production for hospital foodservices
3. To determine the decision strategy, analytical versus intuitive, most predictive of satisfaction with the decision to select/not select cook-chill food production in hospital foodservices.

Methodology

Objective 1

Developing a Generic Model

A study of the decision process required identification and evaluation of the factors considered to be critical in the decision process and the characteristics of successful cook-chill operations. Literature on the decision process in the selection of food production processes was scant (Light and Walker, 1991; Green and Weaver, 1990). Therefore, a generic model (Figure 17) for the decision to select/not select cook-chill food production for hospital foodservices was designed based on a review of decision theory literature (Hill et al. 1978; Keeney and Raiffa, 1976; Radford, 1977; Mintzberg et al. 1976; Witte and Zimmerman, 1986; Simon, 1965). The model was based on the

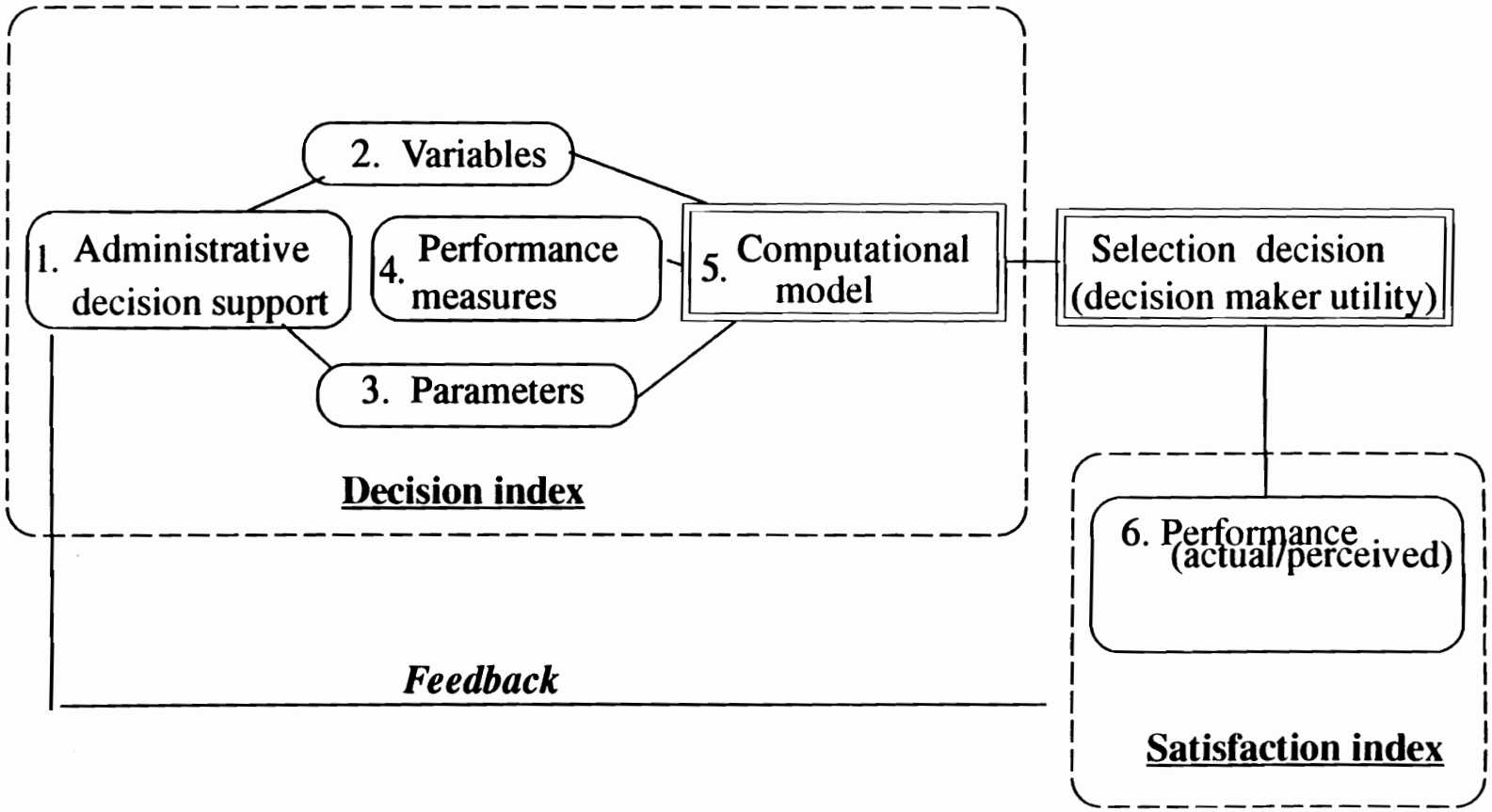


FIGURE 17 Generic Model of the Decision Process to Select /Not Select Cook-chill Food Production for Hospital Foodservices

following components: 1) support for the administrative decision process, 2) identification of variables, 3) specification of parameters, 4) determination of the performance measures, 5) use of the computational model, and 6) evaluation of performance. This model, which was a composite of various models, was reviewed and found to be appropriate for generic decision making (Hill et al. 1978; Keeney and Raiffa, 1976; Mintzberg et al. 1976; Radford, 1977; Simon, 1965; Witte and Zimmerman, 1986). In more specific terms the components of the model can be described as:

1. Administrative decision support component includes those activities related to selection of a group of people for the decision process, accumulation of information, and use various resources to facilitate the decision process.

2. Variables component includes identifying alternatives in the decision process.

3. Parameters component includes measuring, estimating, and forecasting uncontrollable factors that have some bearing on the decision. Parameters are expressed in quantitative terms.

4. Performance measures component includes identifying the dimensions on which the decision is to be evaluated.

5. Computational model component includes the use of information from the variables, parameters, and performance measures components in constructing a mathematical model that relates performance measures to variables and parameters.

Selection decision component adds the analytical components (inputs) of administrative decision support, variables, parameters, and performance measures with the decision maker's subjective perception of utility to make the decision.

6. Actual performance component is based on the evaluation of the difference between the *a priori* performance measures and actual performance. The perceived difference between *a priori* performance measures and actual performance measures create the satisfaction level.

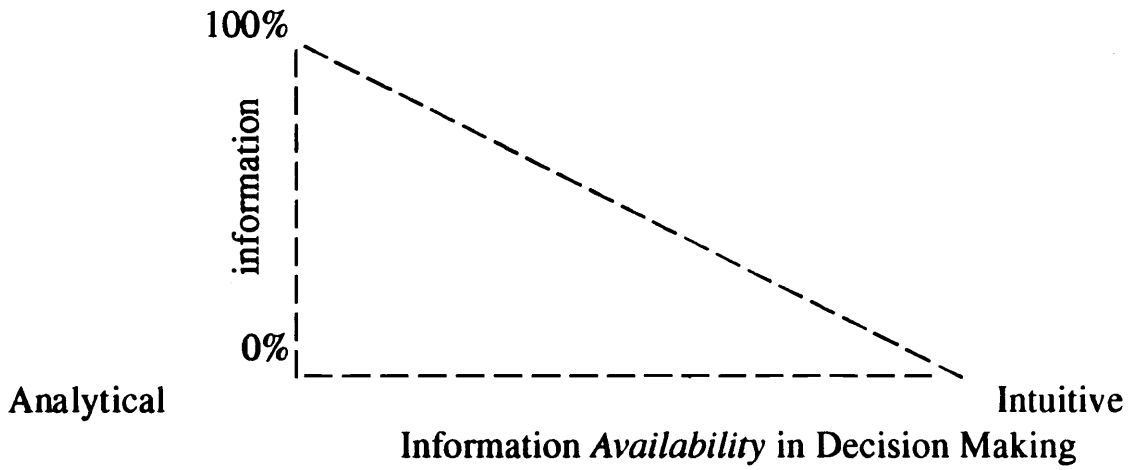
For further clarification, an example of a decision process using this generic model is provided in Appendix D.

The model, developed form a review of literature on decision making, was designed to evaluate and test the primary hypothesis which states:

H1 An analytical decision strategy in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill.

For the purposes of this study, the assessment of the decision strategy, analytical or intuitive, in process of selecting/not selecting cook-chill will be based on 1) the availability of information to make the decision and 2) the use of the information in making the decision. In the review of decision literature, Nutt (1989) stated that an analytical strategy in the decision process would involves four stages: exploring possibilities, assessing options, testing assumptions, and learning. A decision makers using an intuitive decision strategy will attempt to simplify the decision by reducing the mass of information with which he must deal. Nutt (1986) has also said that when uncertainty is low, decision makers are more likely to systematically evaluate all aspects of the decision making process. The uncertainty is higher, there is a tendency for decision makers to use a more intuitive approach. The higher the use of information in the decision process, the more analytical the decision strategy. The lower the use of information, the more intuitive the decision strategy.

Based on Nutt's assessment of decision strategies, this researcher has made the assumption that analytical and intuitive decision strategies fall at opposite ends of an information usage continuum. Decision strategy is related to the level of uncertainty (*amount* of information available) as well as the *use* of the information available (Figure 18). Therefore, the more precisely a decision maker follows the generic decision model, the more analytical the decision strategy.



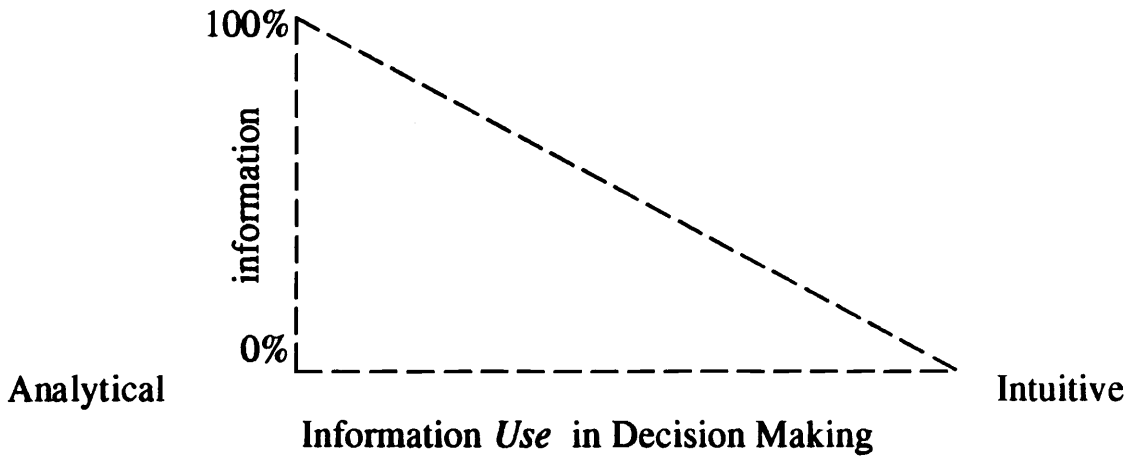


FIGURE 18 The Information Continuum in Decision Making

Based on this generic model of the decision process, several corollary hypotheses were added to the primary hypothesis:

H2 The extent of use of administrative decision support in the process of selecting/ not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H3 The extent of use of decision variables in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H4 The extent of use of parameters in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H5 The extent of use of performance measures in the process of selecting /not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

H6 The extent of use of a computational model which uses variables, parameters, and performance measures in the process of selecting/not selecting cook-chill for hospital foodservices will not have an impact on satisfaction with cook-chill.

Objective 2

Testing the Generic Model

The Delphi Technique

The generic model of the decision process will be tested using the Delphi research technique. Organizations undergoing rapid change are suitable sites for the use of the Delphi research technique. Typically, the Delphi technique is used to examine topics about which there are varying opinions (Linstone and Turoff, 1975). The Delphi technique, a procedure that involves the use of responses from a series of questionnaires (Radford, 1977) in a polling and conferencing process, is based on the premise that the collective judgement of several experts is superior to the opinion of one (Linstone and Turoff, 1975).

The Delphi approach is considered a spinoff from defense research on the process of strategic planning. Its application is useful in business research as a means to an end. The Delphi technique has been found to be of significant value in designing the structure for a model and in compiling current and historical data not previously recorded accurately (Linstone and Turoff, 1975). Results of the Delphi technique have been found to be particularly useful in making recommendations regarding the introduction of new products or technologies (Linstone and Turoff, 1975).

The Delphi technique, which involves the systematic gathering of expert opinions on a topic about which there is little information (Linstone and Turoff, 1975), was selected for use in this study. The expert opinions of the Delphi panel permitted the testing of the generic model for specific use in the decision process of selecting cook-chill food production for hospital foodservices.

The traditional Delphi technique consists of four phases:

1) exploration of the subject and input from an expert panel in the selected field of research

2) development of an understanding of the views of the panel, and discussion and evaluation of differences in opinion within the group of experts

3) evaluation of the differences of opinion with the expert panel

4) return of the final evaluation by the group

Although the Delphi technique has been used for developing models and for new technology, there are several drawbacks with the use of this research method. Although Rand Corporation believed that the Delphi technique represented the beginning of a new field of research, "opinion technology," some statisticians have said that it is the antithesis of scientific forecasting (Linstone and Turoff, 1975). These problems focus primarily on the issue of the time commitment required of the Delphi experts in the iterative three or four phase process and interpretation of the responses of the experts. Because of the small size of the Delphi panel, it may be asked how to chose a "good" group. This issue can be a problem with the formation of any committee, panel, study group, or focus group.

It has been documented in this study that literature regarding foodservice systems has not conclusively answered many of the questions regarding the selection of a food production process. Therefore, the Delphi technique, in which an investigator gathers expert opinions on a topic about which there is little research, was determined to be an appropriate beginning point.

For the purposes of this study, a modified three phase Delphi technique was used. The three phases were (Figure 19): 1) Phase 1 information gathering and Phase 2 ranking of information of the Delphi technique provided the content basis for the questions in

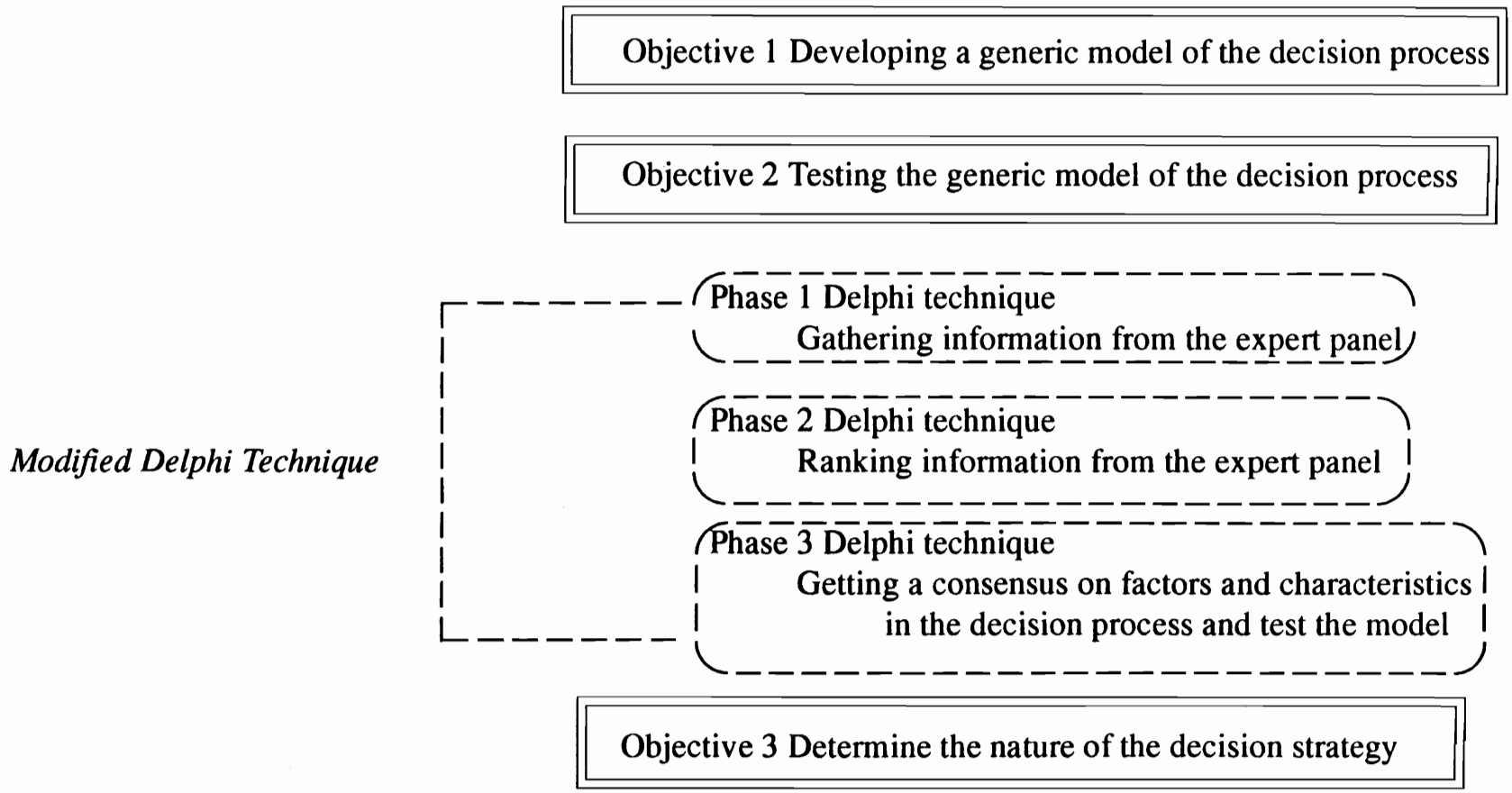


FIGURE 19 The Research Plan

ing of information of the Delphi technique provided the content basis for the questions in the Phase 3 Questionnaire. The responses of the Phase 3 Questionnaire were analyzed in the framework of the decision model through the use of Pearson's correlation.

Data Collection and Analysis

The Delphi panel.

The Delphi panel, a group of fifteen experts in the selection, implementation, and use of cook-chill, were selected based on their experience and willingness to participate in the Delphi panel. This group was selected from the compiled lists of users of cook-chill in hospital foodservices from two manufacturers of cook-chill equipment (see Appendix B). Each expert participating in the Delphi technique was interviewed by phone to solicit participation in this research project.

Phase 1 Gathering information from the expert panel.

On September 30, 1991, each expert agreeing to participate in the Delphi method was mailed a packet of materials including 1)a letter describing the research project (see Appendix B, 2) Phase 1 questionnaires Parts A & B (see Appendix B), and 3) a description of the functional framework for the responses (see Appendix B). The objective of this phase was to explore, gather, and analyze relevant information. Phase 1 involved the collection of opinions on 1) the decision factors in the selection of and 2) the success characteristics in the evaluation of a hospital cook-chill food production process.

In Phase 1 A of the questionnaire, the experts were asked to provide a list of factors that should be considered in the decision to select cook-chill for hospital foodservices (see Appendix B). In Phase 1B of the questionnaire, the experts were asked to list characteristics of a successful hospital cook-chill foodservice (see Appendix B). In both parts of the questionnaire, the Delphi panel members were encouraged to use the framework of the six functional areas of business: human resources, marketing, finance,

included to aid the panel in responding to Phase 1 A&B (see Appendix B). Delphi panel members were asked to respond to and return the questionnaires within one week (i.e. by October 7, 1991).

Phase 2 Ranking the information from the expert panel.

The opinions from Phase 1 were analyzed for content and rephrased into statements pertaining to decision factors and success characteristics for the Phase 2 questionnaire. On January 1, 1992 the Delphi panel experts were mailed the Phase 2 Delphi questionnaire (see Appendix B) with a requested return date of January 17, 1992 An incentive of a chance to win a gift certificate at a major hotel chain to insure a timely return of the questionnaire was also included in the mailing.

The Phase 2 Delphi questionnaire included approximately 75 decision factors and success characteristics. The Delphi panel was asked to rank each of the factors and characteristics for the purpose of obtaining a consensus on the level of importance of the decision factors and success characteristics. The experts expressed their opinions regarding the importance of each of the decision factors and success characteristics through the assignment of ranks on a Likert scale. Decision factors were ranked from very important (1) to unimportant (5). Success characteristics were ranked from highly desirable (1) to highly undesirable (5). The total rank score for each statement was interpreted as an indicator of consensus of opinion. The results of Phase 1 and Phase 2 identified the independent variables (important factors in the decision process) and the dependent variables (important charateristics of satisfaction and success).

Phase 3 Getting a consensus on factors and characteristics in the decision process and testing the model.

The factors and characteristics considered to be important by the experts were included in the framework of the decision model. (see Appendix A). The purpose of the Phase 3 questionnaire was to gain a consensus regarding the nature of the decision strategy in the by quantifying or measuring the administrative decision support, variables, parameters, performance measures, computational model, and performance evaluation. The Phase 3 questionnaire was designed to measure the level of actual use of the generic decision model by decision makers in hospital foodservices.

A Statistical Package for the Social Sciences (SPSS) program was used to analyze correlations between 1) responses on the Phase 3 questionnaire, 2) variables in the components, 3) components of the decision model, and 4) the decision index and satisfaction index (Figure 20). The decision model was tested for appropriateness and statistical significance through the use of a regression analysis of 1) the individual decision components on the satisfaction index and 2) the decision index (composite of decision components) or the satisfaction index (composite of evaluation component)

Objective 3

Determining the Nature of the Decision Strategy

The nature of the decision strategy, analytical versus intuitive, will be based on an interpretation of the statistical analysis of the model and the relationships between the decision process and satisfaction. The nature strategy will be revealeded by how closely the model is followed. In an analytical decision process, more information will be used. In an intuitive decision process, less information will be used (Nutt, 1989).

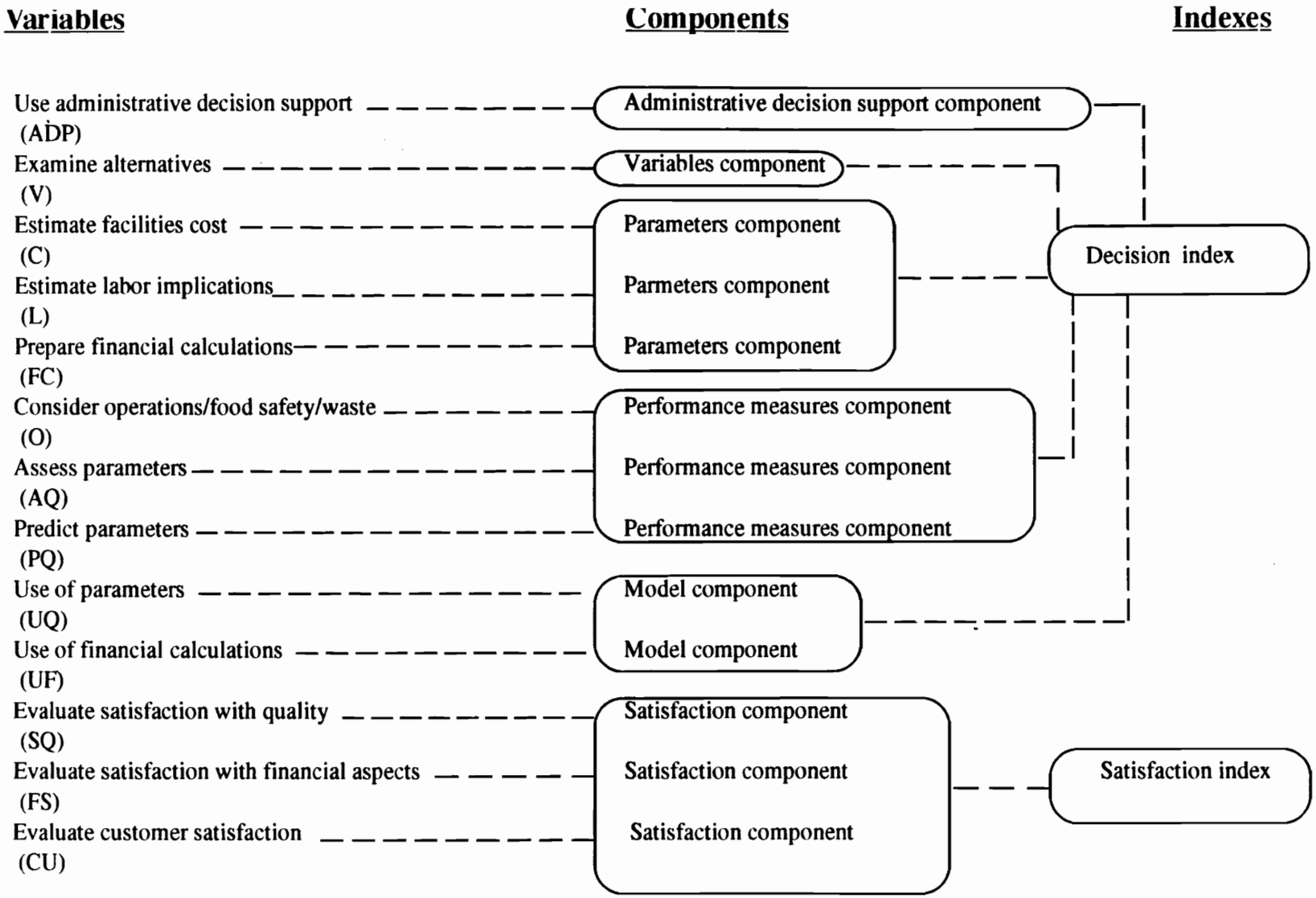


FIGURE 20 The Grouping and Reduction of Phase 3 Questionnaire Delphi Responses

CHAPTER 4

RESULTS AND DISCUSSION

The major purpose of this study was to analyze the decision process used in the selection of cook-chill food production for hospital foodservices. To this end, a prescriptive generic model of a decision process (Figure 17) was designed based on an extensive review of decision theory literature (Hill et al. 1979; Mintzberg et al. 1976; Simon, 1965, Keeney and Raiffa, 1976). Use of the generic decision model provided a framework for determining the analytical versus intuitive nature of the decision strategy in the selection of cook-chill food production in hospital foodservices.

A modified version of the Delphi technique, which incorporates the opinions of a panel of experts (Linstone and Turoff, 1975), was used to gather information on the nature of the decision process in the selection of cook-chill food production in hospital foodservices. The modified Delphi technique included three phases of data gathering which provided the basis for the analysis of the decision process.

In Phase 1 of the Delphi technique, the experts listed decision factors and success characteristics in the selection and use of cook-chill. In Phase 2 the experts ranked the importance and desirability of decision factors and success characteristics. The ranks of the factors and characteristic considered to be important in the decision to select/not select cook-chill were included in development of the Phase 3 Questionnaire. The purpose of this questionnaire was to determine how closely decision makers are following the prescriptive, generic model.

Results of the Delphi Technique

Phase 1 Results

The purpose of the Phase 1 Delphi was to collect opinions on a topic about which there is little known research. To begin Phase 1 of the Delphi research technique, a letter

was sent out on September 30, 1991 to a sample of twenty (20) people who had experience with the selection and implementation of cook-chill food production in hospital foodservices. The cook-chill user mailing lists were obtained from two prominent manufacturers of cook-chill food production equipment (see Appendix B).

The initial mailing included a Phase 1 cover letter explaining the need for the study and an invitation to participate in the Delphi research method as a member of an expert panel. The mailing also included the Phase 1 questionnaire parts A and B (see Appendix B). Each person agreeing to participate in the Delphi panel was asked to list factors considered to be important in the decision to select cook-chill and to list characteristics of a successful cook-chill operation. The experts were asked to use the traditional functional areas of business (human resources, marketing, finance, administration, research and development, and operations) as a framework for the responses (Pearce and Robinson, 1988). A description of the functional framework was enclosed for clarification (see Appendix B).

Follow up phone calls were made and postcards sent during the week of October 15, 1991 to encourage return of the Phase 1 questionnaire and to determine if the experts had any questions about the nature of the Delphi research method. By November 1, 1991, fifteen (15) Phase 1 questionnaires had been returned. This response rate exceeded the required minimum of ten (10) experts to participate in a Delphi technique (Tersine and Riggs, 1976).

The results of Phase 1 Delphi (Table 6) showed that, with regard to decision factors in the selection of cook-chill, the most frequently cited important decision factors were in the areas of operations and research and development. Administration, human resources, finance, and marketing were mentioned less frequently. According to the experts, the most frequently cited measures of success with a hospital cook-chill

TABLE 6

Phase 1 Delphi Questionnaire Results

Functional Area	Number of Responses	
	Decision factors	Success characteristics
Human resources	13	15
Finance	13	5
Marketing	6	6
Administration	14	7
Research & development	16	10
Operations	17	10

foodservice were associated with human resources. This fact has been supported by Light and Walker (1991) whose exploratory work on cook-chill suggested that the human element would be a critical factor in determining the success or failure of a cook-chill operation. Responses from Phase 1 Delphi were reviewed and condensed into a list of 75 decision factors and success characteristics for the Phase 2 Delphi Questionnaire.

Phase 2 Results

On January 1, 1992 the Phase 2 Delphi questionnaires were mailed to the Delphi experts with a cover letter requesting a return date of January 17, 1992. In addition, an incentive of a chance to participate in a drawing with an opportunity to win a $100 gift certificate to a national hotel chain was included (see Appendix B).

The Delphi panel was asked to review a combined list of seventy-five (75) decision factors and success characteristics and to assign a rank to each factor and each characteristic. Because Likert scales have been used extensively in the measuring of attitudes (Brady, 1988; Parten, 1950), one five-point scale for decision factors, ranging from very important (1) to unimportant (5) , and one five-point scale for success characteristics, ranging from highly desirable (1) to highly undesirable (5), were used in this Phase 2 questionnaire. The range of the mean score ranks of the decision factors (Table 7) was from 1.3 to 2.8 and of the mean score ranks of the success characteristics (Table 8) was from 1.3 to 2.5.

The group rank score for each of the seventy-five (75) factors and characteristics (Tables 7& 8) were analyzed on the basis of a format of Quantitative Values Assigned to Importance and Desirability Scales (Table 9) which has been tested for use with the Delphi technique (Linstone and Turoff, 1975). The lower the group score, the more important/desirable the factor/ characteristic. Based on these group rank scores, the Phase 3 questionnaire was designed.

TABLE 7

Phase 2 A Delphi Results

Functional area	Question #	Mean score	Consensus score
Human resources	1	1.5	
	2	2.4	
	3	1.5	2.11
	4	2.2	
	5	2.8	
	6	2.3	
Finance	7	1.5	
	8	2.4	
	9	1.6	1.91
	10	2.8	
	11	1.7	
	12	1.5	
Marketing	13	2.1	
	14	2	
	15	1.9	1.95
	16	1.5	
	17	2.5	
	18	1.7	
Administration	19	2.1	
	20	1.3	
	21	1.3	1.55
	22	1.6	
	23	2.0	
	24	1.6	
Research & development	25	2.8	
	26	2.5	
	27	1.8	
	28	2.2	
	29	2.3	2.19
	30	1.5	
	31	2.3	
	32	2.2	

Table 7 (continued)

Functional area	Question #	Mean score	Consensus score
Research & development (continue	33	1.6	
	34	2.8	
	35	2.1	
Operations	36	2.0	
	37	1.8	
	38	1.9	1.6
	39	1.2	
	40	1.3	
	41	1.4	

TABLE 8

Phase 2 B Delphi Results

Functional area	Question #	Mean score	Consensus score
Human resources	1	1.5	
	2	1.6	1.5
	4	1.2	
	8	2.0	
Finance	3.0	1.3	
	12	1.4	
	13	1.5	1.6
	14	2.6	
	16	1.6	
	23	2.5	
	28		
Marketing	17	1.4	
	18	1.7	
	19	1.3	1.7
	20	2.4	
Administration	21	1.5	
	27		1.5
Research & development	7	1.8	
	29	1.8	2.15
	30	2.5	
	31	2.5	
	32		
	33		
Operations	34		
	5	1.0	
	6	1.0	
	9	1.5	
	10	1.3	
	11	1.4	
	15	2.2	1.6
	22	1.5	
	24	1.7	
	25	2.0	
	26	2.5	

TABLE 9 Quantitative Values Assigned to Importance and Desirablity Scales

Consensus score	Importance	Desirability
Less than 1.80	Very important	Highly desirable
Equal to or greater than 1.80 but less than 2.60	Important	Desirable
Equal to or greater than 2.60 but less than 3.40	Moderately important	Neither desirable nor undesirable
Greater than 3.40 but less than or equal to 4.20	Unimportant	Undesirable
Greater than 4.20	Most unimportant	Highly undesirable

Note. From Linstone, H.A. & Turoff, M. (1975). The Delphi Method: Techniques and Applications.

The purpose of the Phase 3 questionnaire was to measure the extent of current application of this generic model in the decision process to select cook-chill technology for hospital foodservices. The prescriptive, generic decision model (Figure 17) consisted of the five components: 1) support for the administrative decision process, 2) identification of variables, 3) specification of parameters, 4) determination of the performance measures, 5) use of the computational model, and 6) evaluation of performance (see Appendix C).

Phase 3 Results

On March 9, 1992, the Phase 3 Questionnaire and cover letter were mailed to the Delphi experts with a requested return date of April 1 and a repeat incentive of the $100 gift certificate for timely return of the questionnaire. The purpose of the Phase 3 Questionnaire was: 1) to measure appropriateness of the model by determining how closely hospital foodservices followed this prescriptive, generic decision model and 2) to provide data for testing the statistical significance of the model. Eleven (11) questionnaires were returned by April 15, 1992. The results of the Phase 3 Questionnaire revealed the nature of the decision process (Tables10 to 22) in the selection of cook-chill.

When asked for the one most important factor contributing to the selection of cook-chill, the Delphi panel listed the following:

1) reducing food cost and wastage
2) reducing labor and space needs
3) increasing production efficiencies
4) increasing control of food safety
5) developing an image of pioneer in accepting new technology
6) potential savings in future operations

All of the Delphi panel members reported overall satisfaction with the decision to select cook-chill production. Inconsistency in their assessment was found, however,

when they were asked individual questions about satisfaction with specific aspects of the implementation and use of cook-chill in each respective hospital foodservice operation .

The report of results is included in two sections. First, the report contains a descriptive analysis of the demographics of the Delphi panel and the Phase 3 Questionnaire responses using the framework of the normative model (Figure 17). Secondly, a SPSSX program will provide correlations between responses grouped into variables, variables grouped into components, and components grouped into indices of the decision model. A regression analysis of 1) the individual decision (predictor) components on the satisfaction (criterion) components and 2) of the composite decision index and the composite satisfaction index will test the appropriateness and statistical significance of the prescriptive model for the decision process to select cook-chill production for hospital foodservices.

Descriptive Analysis of Results

Profile of the Delphi Panel

The Delphi panel completing the three phase research method consisted of eleven(11) experts who had been chosen on the basis of their experience in the selection, use and implementation of cook-chill food production in hospital foodservices. This group represented foodservice administrators and dietitians in contract management as well as self operating hospital foodservices. Teaching hospitals, private hospitals as well as community hospitals were represented in this panel. Of the eleven experts, eight were currently affiliated with ongoing hospital foodservice operations producing from 50% to 100% of their meals with cook-chill technology. The number of patient meals served daily at the respective locations ranged from 850 to 3162 and non-patient meals from 0 to 3500. In total, the panel members had been involved in over 88 processes of making the decision to select/not select cook-chill food production.

Nature of the Responses to Phase 3 Questionnaire

The generic decision model, which consists of the categories that will be called 1) administrative decision support, 2) variables, 3) parameters, 4) performance measures, 5) computational model, and 6) evaluation of performance will provide the framework for descriptively examining the responses to the Phase 3 Questionnaire.

Step 1 Administrative Decision Support

The initial stages of a decision making process are characterized by the gathering of data, searching for facts, and the developing of new channels of information to assist in the definition of the decision at hand (Hill et al. 1978; Mintzberg et al. 1976). In the early phases of the decision process of selecting cook-chill production, the Delphi panel reported that the most frequently used information sources (Table 10) were other cook-chill users (100 %), foodservice consultants (82%), equipment suppliers (82%), manufacturer's representatives (82%), seminars and conferences (82%), industry journals (73%), and professional journals (64%). In addition, 91% of the experts reported that decision makers visited other cook-chill operations during the process of deciding to select cook-chill. Ninety-one percent also reported that these visits had an impact on the decision process. One Delphi panel member made a comment about the lack of quality articles on the use of cook-chill in professional journals. Another member cautioned against the dependence on outside resource people who "make very optimistic estimates of lower costs" with cook-chill technology (see Appendix C).

According to Light and Walker (1991), decision makers at successful cook-chill operations were more likely to seek out a large number of resources during the process of making the decision to select cook-chill. They also reported that decision makers at unsuccessful operations were less likely to seek out the advice of other cook-chill operations during the decision process.

TABLE 10

Information Sources Used in the Decision Process to Select Cook-chill

Information resources	Yes	%	No	%
Foodservice consultants	9	82	2	18
Foodservice equipment suppliers	9	82	1	18
Manufacturers representatives	9	82	1	18
Other cook-chill users	11	100	0	0
Industry journals	8	73	3	27
Professional journals	7	64	4	36
Seminars and conferences	9	82	2	18

Based on the experiences of the Delphi panel members, the decision to select cook-chill was usually done by a group of people, 69% of whom had foodservice experience. The time that typically elapsed between consideration and implementation of cook-chill ranged from 13 months to over 5 years. On a scale from negative to indifferent to positive, 91% of the people in hospital administration had either 1) no opinion (indifferent) or 2) a positive opinion about the introduction of cook-chill.

Step 2 Identification of Variables

Other alternatives considered in the decision process (Table 11) were convenience foods (50%) and cook-freeze foods (27%). Both tumble-chill and blast-chill processes were given serious consideration (82%). In a comparison of decision processes of successful and unsuccessful cook-chill operations, Light and Walker(1991) found that there was a tendency to give little consideration to other alternative food production processes. This predetermined approach supports the contention that decisions are often made before the problem has been clearly identified (Mintzberg et al. 1976). The percentage of foods to be prepared by cook-chill (100%) as well as the existing (82%) and projected food production demands (82%) were variables receiving high levels of consideration. The experts agreed that there was a need to develop, adapt, and test new recipes for cook-chill (100%), but only 67% agreed that there was a need for a test kitchen. Although dietary and nursing staff were considered as alternative staff for rethermalizing cook-chill foods, the use of the dietary staff had a higher priority (82%).

On an average, less than half (43%) of the hospital foodservices considered using cook-chill as a means to increase revenue (Table 12) through marketing to other foodservices. Hospitals (64%), elderly feeding programs (64%), and nursing homes (45%) were the sites most frequently considered as marketing opportunities.

TABLE 11

Alternatives Considered in the Decision Process to Select Cook-chill

Alternatives	Yes	%	No	%
Use of convenience food as alternative	5	50	5	50
Use of cook-freeze as alternative	3	27	8	63
Selection of blast chill versus tumble chill	9	82	1	18
Percentage of menu item to be made by cook-chill	10	100	0	0
Estimating equipment capacity based on existing demand	9	90	2	10
Estimating equipment capacity based on projected demand	9	82	2	18
Need for a test kitchen	7	70	3	30
Need for recipe testing prior to cook-chill	9	90	1	10
Need to develop new recipes	11	100	0	0
Need to adapt and test	11	100	0	0
Responsbility of dietary staff for retherm	9	82	2	18
Responsiblity of nursing staff for retherm	5	63	4	37

TABLE 12

Marketing Opportunities Considered in the Decision to Select Cook-chill

Marketing opportunities	Yes	%	No	%
Other hospitals	7	64	4	36
Nursing homes	5	45	6	55
Elderly feeding programs	6	64	5	34
Schools	2	18	9	82
Day care centers	3	27	8	73

Step 3 Specification of Parameters

The first consideration with regard to the quantification of alternatives was the choice of a person to perform the calculations. During the decision process, 91% of the experts reported that financial calculations were made. The most frequently cited resources for calculations (Table 13) were the hospital foodservice administrator (88%) followed by outside consultants (55%). One Delphi member cautioned that close scrutiny be given to assure accuracy of the figures used in the decision process (see Appendix C).

The calculations focused on food, labor, equipment, and other expenses (Table 14, 15, 16, 17). Total dietary salary expense (88%), and total dietary expense (88%) before and after cook-chill were the most often calculated. Hospital food cost percentage was figured in 86% of the decision processes, yet only 37% of the panel reported that food cost was actually based on monthly inventory figures (Table 14). Although reduction of food waste was considered as a reason for selecting cook-chill, food waste was regularly recorded (Table 17) in only 63% of the operations.

The break-even point, where sales meet expenses and there is no profit nor loss, was figured in only three (43%) of the decision processes. The most frequently used measure of financial performance was the projected payback period (83%). Net present value and return on investment were each tabulated 67% of the time (Table 14).

Reduction in labor cost was one of the most frequently mentioned reasons for selection of cook-chill, however, the Delphi panel reported that total meals served per labor hour, (Table 18) a industry standard for productivity measure (Matthews, 1975), was calculated by only two (40%) of the five experts responding to these questions. Foodservice labor cost percentage, another industry measure, was calculated in only 71% of the situations. Other labor measures such as labor minutes per meal (44%) and calcu-

TABLE 13

Person Responsible for Financial Calculations in the Decision Process to Select Cook-chill

Responsible for calculations	Yes	%	No	%
Outside consultant	6	67	3	33
Sales representative	3	33	6	67
Manufacturers representative	2	29	5	71
Hospital accounting office	2	29	5	71
Hospital foodservice administrator	7	88	1	12

TABLE 14

Financial Calcuations *Made* During the Decision Process to Select Cook-chill

Financial calculations:	Yes	%	No	%
Hospital food cost percentage	6	86	1	14
Base food cost calculation on monthly inventory	3	37	5	63
Hospital food cost percentage after cook-chill	6	86	1	14
Total dietary expense	7	88	1	12
Total dietary expense after cook-chill	7	88	1	12
Total dietary salary expense	7	88	1	12
Total dietary salary expense after cook-chill	7	88	1	12
Foodservice labor cost percentage	5	71	2	29
Foodservice labor cost percentage after cook-chill	5	71	2	29
Total meals served per hour	2	29	5	71
Total meals served per hour after cook-chill	3	37	5	63
Break even point	3	43	4	57
Net present value	4	67	2	33
Return on investment	4	67	2	33
Payback period	5	83	1	17

TABLE 15

Human Resources Considerations in the Decision Process to Select Cook-chill

Human resource considerations	Yes	%	No	%
Shortage of skilled labor	3	33	6	67
Abundance of skilled labor	3	33	6	67
Staffing cost of test kitchen	2	22	7	78
Reduction in staff due to cook-chill	8	73	3	7
Calculate the full time equivalents	4	44	5	56
Calculate # of labor minutes/meal	3	44	5	56

TABLE 16

Cost Considerations in the Decision Process
to Select Cook-chill

Cost consideration	Yes	%	No	%
Cost of equipment	11	100	0	0
Cost of installation	11	100	0	0
Cost of facility renovation	10	91	1	9
Cost of employee training	7	78	3	22
Cost of floor pantries	4	67	1	33
Cost of test kitchen	4	50	4	50
Cost of rethermalization equipment	9	100	0	0
Cost of delivery equipment	8	80	2	20

TABLE 17

Operational Measuares Considered in the Decision Process to Select Cook-chill

Considerations	Yes	%	No	%
Calculate food cost based on monthly inventory	3	37	5	63
Record food waste	3	43	4	57
Administer customer surveys	8	73	2	20
Administer patient surveys	9	90	1	10
Use customer suggestion boxes	3	33	6	67
Record food acceptance	5	63	3	37
Provide standard recipes in all production areas	7	73	4	27
Assure that employees followed standard recipes	4	37	7	63
Provide standard portioning tools	8	80	2	20
Assure that employees serve standard portions	6	60	4	40

TABLE 18

Financial Calculations *Used* in the Decision Process to Select Cook-chill

Financial calculations	Yes	%	No	%
Use of hospital food cost percentage	4	80	1	20
Use of total dietary expense	6	100	0	0
Use of total dietary salary expense per meal	7	100	0	0
Use of foodservice labor cost percentage	3	50	3	50
Use of total meal served per labor hour	2	40	3	60
Use of breakeven point	2	33	4	67
Use of net present value	3	60	3	40
Use of return on investment	5	83	1	17
Use of projected payback period	7	88	1	12

lation of full time equivalents (FTE) (44%) were computed in less than half of the hospital foodservice operations (Table 15). Most of the decisions (73%) included the plans for reduction in staff after installation of cook-chill. Plans were made for staffing a test kitchen in only 22% of the decision processes. Little attention was focused on the shortage (33%) or abundance (33%) of skilled foodservice labor as a factor in the decision to select cook-chill (Table 15).

Cost considerations in the selection of cook-chill were primarily focused on the cost of equipment (100%), installation (100%), facility renovation (91%), rethermalization equipment (100%), delivery equipment (80%) and upgrading of floor pantries (88%) (Table 16). Less emphasis was given to the cost of employee training (78%) and establishing a test kitchen (67%) (Table 16). Although it was agreed by all experts that there was a need to develop (100%), test (100%) , and adapt new recipes (100%) with cook-chill (Table 11), the cost of staffing a test kitchen, however, was given consideration in only 22% of the situations (Table 15). According to one Delphi expert, the "setting up and proper use of a test kitchen is probably the difference between a successful introduction (of cook-chill) and a disastrous one "(see Appendix C). Although preliminary assessments were made of selected measures (Table 19) such as quality of food (82%), consistency of food (100%), customer satisfaction (78%) , food waste (63%), food holding temperatures (89%), and food storage times (50%), these measures were used in the decision process less than 70% of the time.

Step 3 Performance Measures

The primary categories of measures of performance which evolved from the Delphi technique were financial, operational, and human. To be effective, performance measures should be determined *prior* to making the decision to select cook-chill technology. Predicting various performance measures involves assessing the existing perfor-

mance and making a forecast of what performance would be expected after cook-chill technology is operational.

Financial performance measures.

Decision makers involved in the decision process predicted for hospital food cost percentage (86%), total dietary expense (88%), total dietary salary expense (88%), and food cost labor percentage (21%). Although total meals served per hour is considered an industry index of employee productivity, it was only predicted in 38% of the decision processes.

Human performance measures.

It was reported that 78% of the hospital foodservices predicted customer satisfaction after the introduction of cook-chill foods . Customer satisfaction was considered in 75% of the decision processes. Both patients (90%) and non-patient (73%) satisfaction surveys were administered (Table 19).

Operational measures.

The Delphi panel reported that operational measures of food quality and consistency were predicted in 100% of the decision processes. Food waste was recorded in 63% of the foodservice operations prior to cook-chill. Approximately 78% of the operations predicted food waste after the installation of cook-chill, but only 30% reported considering amount of food waste in the decision process to select cook-chill. Control over food holding temperatures was predicted in 78% of the decisions to select cook-chill. Food storage times were predicted for cook-chill in 50% of the operations.

Step 5 The Computational Model

The decision model (Figure 17) itself is an example of a decision aid. Kottemann and Davis (1991) have reported that the use of multicriteria decision making aids is confounded by the decisional conflict introduced through the use of these aids.

TABLE 19

Assessment, Prediction, and Use of Operational Measures in the Decision Process to Select Cook-chill

Measures	Yes	%	No	%
Assess quality of food before cook-chill	9	82	1	18
Predict quality of food after cook-chill	11	100	0	0
Use quality assessments to support cook-chill decision	8	73	3	27
Assess consistency of food before cook-chill	9	100	0	0
Predict consistency of food after cook-chill	11	100	0	0
Use consistency assessments to support cook-chill decision	6	67	3	33
Evaluate customer satisfaction before cook-chill	7	78	2	22
Predict customer satisfaction after cook-chill	8	78	2	22
Use customer satisfaction to support cook-chill decision	6	75	2	25
Record amount of food wastage before cook-chill	5	63	3	37
Predict amount of food wastage after cook-chill	7	78	2	22
Use food wastage to support cook-chill decision	3	30	7	70
Monitor food holding temperatures before cook-chill	8	89	1	11
Predict food holding temperature after cook-chill	7	78	2	22
Use food holding temperatures to support cook-chill decision	5	56	4	44
Monitor food storage time before cook-chill	4	50	4	50
Predict food storage time after cook-chill	4	50	4	50
Use food storage time to support cook-chill decision	3	33	6	67

Faced with the decision to select/not select cook-chill, the decision maker may choose a noncompensatory or compensatory strategy. In the noncompensatory stance, the decision maker would arrive at a conclusion through elimination of decision alternatives based on undesirable aspects. The compensatory stance, which is used more often, requires that judgements and tradeoffs be made among the performance measurements and across alternatives. In this stance, there is higher decisional conflict. Faced with decisional conflict, the decision maker often chooses less sophisticated processes, such as intuition and "gut feeling" over more analytical decision processes.

The Selection Decision

The decision process is the culmination of all of the preceeding steps when an alternative among others is chosen. At this point the decision maker uses information gathered to arrive at the final decision which may be analytical or intuitive in nature. The utility of the alternatives to the decision maker play an important role in this step. Utility is a subjective assessment of the overall performance of a decision. Determination of utility is not an impossible task, but is as much of an art as a science. Keeney and Raiffa (1976) established a five part procedure for determining the utility function:

1) prepare for the assessment
2) identify the relevant qualitative characteristics
3) specify quantitative restrictions
4) choosing a utility function
5) checking for consistency

Badinelli and Baker (1990) have presented a method of examining the effort, time, and resolution of decision makers as they deal with multicriteria decision problems. The procedure demonstrated by these researchers suggests that a decision maker's determination of tradeoff and utility of a decision is an iterative process that requires feedback to the decision maker. An examination of the nature of utility and tradeoffs are beyond the

scope of this study and will, therefore, be considered as a subjective component of this generic model.

In the selection decision, the decision makers exercised the option to use/not use the information gathered throughout the decision process. In this study, hospital food cost percentage was calculated by 86% of the decision makers, only 80% used this information in the decision process. Total dietary expense and total dietary salary expense were used by 100% of the people who calculated these figures during the decision process. Although foodservice labor cost percentage was calculated by 71% of the decision makers, only 50% actually used the percentage in the decision process. Total meals served per labor hour was calculated by only two decision makers in this study. The break-even point was calculated in three decision processes and used in the decision process by only two people. NPV(net present value) was calculated by four people and used by three. Some results that cannot be explained are that four people reportedly calculated return on investment while five people reported using this figure in the decision process. Similarly, five people calculated payback while seven reported using payback in the decision process (Tables 14,18).

During the decision process, predictions and assessments of various measures such as food quality, food consistency, customer satisfaction, food waste, food holding temperature, and food storage times were made. The Delphi panel reported, however, these measures were used less that 55% of the time in the actual decision making. Customer satisfaction was used in 75% of the decision processes with patient (90%) and non-patient (73%) surveys.

Step 6 Evaluation of Performance

The primary consideration is the success of the cook-chill operations in meeting established performance standards or goals. Success is expressed in terms of the level of

decision maker satisfaction with the cook-chill. Literature supports the theory that success is associated with achievement of goals (Berg, 1986). The Delphi experts were asked to report their satisfaction with regard to achieving success with financial, human resources, and operational aspects of the cook-chill food production process.

Financial satisfaction.

Delphi panel members reported that, overall, 86% of the decision makers were also satisfied with the total financial investment in the production process. Although 100% of the decision makers were satisfied with the food cost percentage, only three of the eleven panel members reported that food cost calculation was based on monthly inventory figures. The panel also reported that 86% were satisfied with the foodservice labor cost percentage.

Over 33% were satisfied with the use of payback period as a method to value the investment in cook-chill. Break-even analysis and net present value were calculated in only three and four of the processes, respectively. Of those that did use this measure, only 33% were satisfied with using the break-even point, 17% were satisfied with NPV and 43 % were satisfied with return on investment assessment of the financial performance.

Although payback period was the most frequently used method for assessing the investment in cook-chill, literature does not support its use as the best measures of the cost of an investment. According to Coltman (1979) and Tarras (1991), decision makers need to measure the rate of return on an investment as well as measure how well the investment compares with other projects to make an intelligent decision. Investors judge the success of an investment on how much money will be returned over the life of the project. Simple payback, unlike net present value, fails to consider the time value of money. NPV is more useful, though used less often, since it provides an easier comparison of alternative investments in which the amount and time of the cash flows may vary (Table 20).

TABLE 20

Satisfaction with Financial Calculations after the Decision to Select Cook-chill

Financial calculations	Yes	%	No	%
Use hospital food cost percentage	4	80	1	20
Use total dietary expense	6	100	0	0
Use total dietary salary expense per meal	7	100	0	0
Use foodservice labor cost percentage	3	50	2	50
Use total meal served per labor hour	2	40	3	60
Use break-even point	2	33	3	67
Use net present value	3	60	3	40
Use return on investment	5	83	0	17
Use projected payback period	7	88	1	12

Human satisfaction.

With regard to human performance, the experts were satisfied with extent of application of employee training in production techniques (87%) and in rethermalization (75%). Acceptance of the cook-chill production process was reportedly high by patients (100%), non-patients (100%), foodservice staff (100%), nursing staff (89%), administrative staff (100%), and medical staff (78%). Acceptance of the food prepared by cook-chill was reported slightly lower by the patient (88%), foodservice staff (75%), nursing staff (63%) administrative staff (86%), and medical staff (86%). The lower acceptance by the nursing staff may be a function of how much responsibility nurses are asked to take in the rethermalization and service of food to the patients (Table 21).

Operational satisfaction.

The overall satisfaction with food safety, storage, and holding with cook-chill was 74%. The highest level of satisfaction was in elimination of overproduction (100%), control of storage times (86%), production techniques (75%), storage temperatures (71%), and food holding time (71%). Of the seven panel members responding, only three were satisfied with the examination of the bacterial content of food prepared by cook-chill techniques (Table 22).

Statistical Analysis of Phase 3 Results

Overview of the Statistical Analysis

The Delphi 3 Questionnaire elicited 136 objective responses from each of the eleven (11) experts. These data were statistically analyzed using frequencies, correlation, and regression procedures of the SPSSX system. Pearson correlations were used to reveal the nature of the relationship between the independent and dependent variables. A Phi coefficient was calculated on the dichotomous responses from the Delphi 3 Questionnaire. Phi coefficient is a type of Pearson's correlation which measures the degree of

TABLE 21

Satisfaction with Human Element of the Decision to Select Cook-chill

Human elements	Yes	%	No	%
Use of employee training	8	89	1	11
Training in retherm	6	75	2	25
Acceptance of system by patient				
By patient	8	100	0	0
By non-patient	7	100	0	0
By foodservice staff	8	100	0	0
By the nursing staff	8	89	1	11
By administrative staff	9	100	0	0
By medical staff	7	78	2	22
Acceptance of food by patient				
By patient	7	88	1	12
By non-patient	6	100	0	0
By foodservice staff	6	75	2	25
By nursing staff	5	63	3	37
By administrative staff	6	86	1	14
By medical staff	6	86	1	14

TABLE 22

Satisfaction with Operational Measures After the Decision to Select Cook-chill

Holding, Storage, and Safety	Yes	%	No	%
Satisfaction with ability to reduce spoilage due to due to				
Eliminating over production	7	100	0	0
Controlling production techniques	6	75	2	25
Controlling storage times	6	86	1	14
Controlling storage temperatures	5	71	2	29
Controlling food holding times	5	71	2	29
Examining bacteria content	3	38	5	62

correlation between pairs of dichotomous variables using a 2x2 contingency table. A positive correlation of 1.0 would be graphically represented by a diagonal line of coordinates across the table. A zero or close to zero correlation would be demonstrated graphically by a distribution of plots across the table in no specific pattern.

After examining the correlations between pairs of responses, the responses for each question were totalled (Table 23). This process changed the nature of the data from dichotomous to continuous. The totalled responses for each question were grouped into the respective thirteen(13) variables the responses measured (administrative decision support (ads), financial calculations (fc), use of financial calculations (fu), alternative variables (v), assessment of quality (aq), prediction of quality (pq), use of quality assessment (uq), cost variables (c), labor variables (l), operational variables (o), satisfaction with quality (sq), customer satisfaction (cu), and satisfaction with financial performance (fs) Figure 20). Using the data in the continuous form, Pearson's correlation between the thirteen variables were calculated.

These thirteen (13) variables were then organized into five (5) decision components (independent) and one satisfaction component (dependent) based on the framework of the generic model of the decision process (Figure 17). The decision components were grouped to provide a single decision index and the satisfaction component was renamed the satisfaction index (Figure 20). Regression was the statistical method chosen to determine the appropriateness and the statistical significance of the generic model when applied to the decision process to select cook-chill food production in hospital foodservices. A regression of the decision index on the satisfaction index was chosen due to the existence of high correlations between the five (5) individual decision components and the one (1) satisfaction component. This grouping was done in an effort to reduce the effect of the multicollinearity.

TABLE 23 Techniques of Analysis of Dichotomous and Continuous Data

Delphi panel	Response 1	Response 2	Response 3	*Response 4*	*Response 5*	*Response 6*
1	0	1	1	0	1	1
2	1	0	1	1	0	1
3	0	1	1	0	1	0
4	1	0	0	1	1	1
5	0	1	0	0	1	0
6	1	0	1	1	0	1
7	1	0	0	1	0	1
8	1	0	1	1	0	1
9	0	1	0	1	0	1
10	1	0	1	1	0	1
11	0	1	0	1	0	1
Total* 0	5	6	5	3	7	2
Total* 1	6	5	6	8	4	9

Variable 1 sum 1 to 3	*Variable 2* sum 4 to 6	Total **
2	2	4
2	2	4
2	1	3
1	3	4
1	2	3
1	2	3
1	2	3
2	2	4
1	2	3
2	3	5
1	2	3
16	23	39

Use of Phi Coefficient for Dichotomous Data

*Phi coefficient is a procedure that correlates "yes"/"no" responses in pairs through the use of a 2x2 matrix.

		0	1
Response 1			
Response 2	0	5	6
	1	6	5

Let's say that all 11 Delph members answered Response 1 a Response 2. This means at 5 answered Response 1 with "no" and 6 answered Response 2 with "yes." A perfect 1.0 correlation between the two Responses would create a diagonal across the square as demonstrated by the dotted lines. Lack of correlation would mean that there was no consistency in the responses.

Use of Pearson's Coefficient for Continuous Data

**Pearson's correlations compares continuous data. The data was changed to continuous by adding the number of "yes" and "no" responses to create Total **.

+ If Responses 1 to 3 measured the variable "assessing quality," the highest score for that variable would be 33 (3 responsees x 11 Delphi membersresponding "yes") the lowest score would be "0" (3 responses x 11 Delphi members responding "no.")

+After the value of each of the 13 variables was totalled, the next step was to statistically analyze the relationships between the variables through the use of Pearson's correlations and regression. [The maximum total score on all variables measuring the decision process is 101 and the satisfaction component is 35 per Delphi member responding.]

Initial Interpretation of the Results

Phi and Pearson's Correlation of Variables

The dichotomous, "yes" and "no," responses for each question of the Phase 3 Questionnaire were coded "1" and "0", respectively. The responses of the Delphi experts were combined and frequencies of "yes" and "no" responses were calculated for each question (see Appendix B). Related questions were categorized into the thiriteen (13) variables they measured: administrative decision support (ads), financial calculations (fc), use of financial calculations (fu), alternative variables (v), assessment of quality (aq), prediction of quality (pq), use of quality assessment (uq), cost variables (c), labor variables (l), operational variables (o), and dependent variables satisfaction with quality (sq), customer satisfaction (cu), and satisfaction with financial performance (fs). The purpose of this grouping process was to permit testing of the generic model with responses from the expert panel.

Phi correlations between selected pairs of quality and financial variables were computed. The selection of variables for this analysis was comprised of variables that measured the relationship between *gathering information* and *using the infomation* for the decision process. Literature has supported that decision makers will tend to take a more analytical decision approach when information regarding the decision is available and when there is low uncertainty (Nutt, 1989). An analytical decision strategy involves the use of information while an intuitive decision strategy depends less on information and more on "gut feeling." The variables used in the Phi coefficient calculation included: assess quality (aq), predict quality (pq), use quality (uq), and satisfaction with quality (sq) financial calculations (fc), predict financial calculations (fp), use financial calculations (fu) and satisfaction with financial performance (fs).

The results of the Phi correlations revealed that as assessment of quality increased, satisfaction with quality increased (Table 24). The more frequently a decision maker planned (predicted) quality, the more satisfied he was with quality. Similarly, as the use of quality (uq) assessments in the decision process increased, satisfaction with quality also increased (Tables 25& 26).

With regard to financial calculations, a positive linear relationship existed between making financial calculations (fc) and predicting financial performance (fp), using financial calculations (fc), and being satisfied with financial performance (fs) (Tables 27 28 & 29).

The results of the high positive Phi correlations between pairs of independent variables support the rejection of the primary hypothesis:

H1 Use of an analytical decision strategy in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill.

The next step in the statistical analysis was to determine the correlation between the thirteen(13) independent and dependent variables identified through the three phase Delphi technique. Correlations between the thirteen variables were between .6751 and .9948 (all significant at the <.05 level) (Table 30).

Each of the variables was assigned to (Figure 20) the appropriate component of the decision model: administrative decision support, variables, parameters, performance measures, computational model, and satisfaction (Figure 17). Pearson's correlation was computed between the five decision components and the one satisfaction component in the generic decision model. There was a high correlation (from .8837 to .9885) (all significant at the <.01 level) between all the components (Table 31) . The highest correlation was between the satisfaction component and the computational model (.9677) followed in descending order of significance by parameter component (.9603), adminis-

TABLE 24 Phi Correlations between Assessing Quality and Satisfaction with Quality

AQ by SQ

Page 1 of 1

AQ \ SQ (Count)	.00	1.00	3.00	6.00	7.00	Row Total
6.00	1					1 12.5
8.00		1				1 12.5
9.00			1			1 12.5
11.00				1		1 12.5
13.00				1		1 12.5
15.00					3	3 37.5
Column Total	1 12.5	1 12.5	1 12.5	2 25.0	3 37.5	8 100.0

TABLE 25 Phi Correlations between Predicting Quality and Satisfaction with Quality

PQ by SQ

Page 1 of 1

PQ \ SQ (Count)	.00	1.00	3.00	6.00	7.00	Row Total
2.00	1					1 12.5
5.00		1	1	1		3 37.5
6.00				1	3	4 50.0
Column Total	1 12.5	1 12.5	1 12.5	2 25.0	3 37.5	8 100.0

TABLE 26 Phi Correlations between Using Quality Measures and Satisfaction with Quality

UQ by SQ

Page 1 of 1

UQ \ SQ (Count)	.00	1.00	3.00	6.00	7.00	Row Total
1.00	1	1				2 25.0
3.00			1			1 12.5
4.00				2		2 25.0
6.00					3	3 37.5
Column Total	1 12.5	1 12.5	1 12.5	2 25.0	3 37.5	8 100.0

TABLE 27 Phi Correlations between Financial Calculations and Satisfaction with Financial Performance

FC by FS

Page 1 of 1

FC \ FS (Count)	1.00	3.00	4.00	6.00	8.00	9.00	Row Total
4.00	1						1 14.3
6.00		1					1 14.3
9.00			1				1 14.3
11.00			1				1 14.3
14.00					1		1 14.3
15.00				1		1	2 28.6
Column Total	1 14.3	1 14.3	2 28.6	1 14.3	1 14.3	1 14.3	7 100.0

TABLE 28 Phi Correlations between Predicting Financial Measures and Satisfaction with Financial Performance

FP by FS

Page 1 of 1

FP \ FS (Count)	1.00	3.00	4.00	6.00	8.00	9.00	Row Total
2.00	1	1					2 28.6
3.00			2				2 28.6
4.00				1	1	1	3 42.9
Column Total	1 14.3	1 14.3	2 28.6	1 14.3	1 14.3	1 14.3	7 100.0

TABLE 29 Phi Correlations between Using Financial Measures and Satisfaction with Financial Performance

FU by FS

Page 1 of 1

FU \ FS (Count)	1.00	3.00	4.00	6.00	8.00	9.00	Row Total
2.00	1						1 14.3
3.00		1					1 14.3
4.00			1				1 14.3
5.00							1
7.00				1			1 14.3
9.00					1	1	2 28.6
Column Total	1 14.3	1 14.3	2 28.6	1 14.3	1 14.3	1 14.3	7 100.0

TABLE 30 Correlations between Thirteen Independent and Dependent Varaibles

	ADP	FU	AQ	UQ	PQ	C	L
ADP	1.0000	.9923**	.9814**	.9378**	.9241**	.9593**	.8576**
FU	.9923**	1.0000	.9671**	.9541**	.8092*	.9068**	.9374**
AQ	.9814**	.9671**	1.0000	.9590**	.9380**	.9530**	.8754**
UQ	.9378**	.9541**	.9590**	1.0000	.8908**	.8980**	.9142**
PQ	.9241**	.8092*	.9380**	.8908**	1.0000	.9165**	.7762**
C	.9593**	.9068**	.9530**	.8980**	.9165**	1.0000	.8481**
L	.8576**	.9374**	.8754**	.9142**	.7762**	.8481**	1.0000
FC	.9623**	.9624**	.9948**	.9716**	.8685**	.9347**	.8730**
V	.9827**	.9670**	.9728**	.8961**	.8923**	.9623**	.8180**
CU	.9221**	.7814*	.9353**	.9169**	.9379**	.8914**	.7058*
O	.8628**	.8756**	.7915**	.7263*	.6795*	.8664**	.7032*
SQ	.9223**	.9058**	.9599**	.9610**	.8197*	.8620**	.7677*
FS	.9765**	.9821**	.9083**	.9354**	.7717*	.7717*	.9237**

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed) " . " printed if a coef

	SQ	FS	FC	V	CU	O
ADP	.9223**	.9765**	.9623**	.9827**	.9221**	.8628**
FU	.9058**	.9821**	.9624**	.9670**	.7814*	.8756**
AQ	.9599**	.9083**	.9948**	.9728**	.9353**	.7915**
UQ	.9610**	.9354**	.9716**	.8961**	.9169**	.7263*
PQ	.8197*	.7717*	.8685**	.8923**	.9379**	.6795*
C	.8620**	.7717*	.9347**	.9623**	.8914**	.8664**
L	.7677*	.9237**	.8730**	.8180**	.7058*	.7032*
FC	.9648**	.9179**	1.0000	.9869**	.8626**	.8084*
V	.9366**	.8966**	.9869**	1.0000	.8821**	.8962**
CU	.9201**	.6774	.8626**	.8821**	1.0000	.6751*
O	.6840	.8819**	.8084*	.8962**	.6751*	1.0000
SQ	1.0000	.8488*	.9648**	.9366**	.9201**	.6840
FS	.8488*	1.0000	.9179**	.8966**	.6774	.8819**

TABLE 31 Correlations between Five Decision Components and One Satisfaction Component

- - Correlation Coefficients - -

	ADMIN	PARAM	VE	PERFM	MODEL	SATIS
ADMIN	1.0000	.9439**	.9827**	.9895**	.9354**	.9566**
PARAM	.9439**	1.0000	.9131**	.9618**	.9885**	.9603**
VE	.9827**	.9131**	1.0000	.9811**	.8837**	.9157**
PERFM	.9895**	.9618**	.9811**	1.0000	.9412**	.9649**
MODEL	.9354**	.9885**	.8837**	.9412**	1.0000	.9677**
SATIS	.9566**	.9603**	.9157**	.9649**	.9677**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed) " . " printed

trative decision support component (.9566) and finally, variable component (.9157) (all significant at the <.01 level).

The high correlation between components in the model also suggests that if a group of decision makers use one of the decision components such as analysis of alternative variables in the decision to select cook-chill, they are also highly likely to plan the administrative decision support as well as examine the parameters, performance measures in the use of the computational model. On the other hand, this direct relationship also shows that if the group of decision makers were less analytical and more intuitive, they would also be consistently intuitive across the decision components and may obviously, have a lower satisfaction with the ultimate performance .

The next statistical analysis was to determine the relationship between the decision index and satisfaction index. The decision index is composed of all components of the decision process (admnistrative decision support, variables, parameters, performance measures, and computational model) while the satisfaction index is composed of the satisfaction component. The decision and satisfaction indices (Table 32) were also highly correlated (.9740) (both significant at the <.01 level) . The high correlations permitted the rejection of several of the following corollary hypotheses:

Corollary hypotheses

H2 The extent of use of administrative decision support in the process of selecting/ not selecting cook-chill will not have an impact on satisfaction with cook-chill.

Administrative decision support involves the gathering of information about a topic which may include resources such as consultants, publications, conferences, and seminars. A correlation of .9566 (significant at the <.01 level) between the administrative decision support and satisfaction with cook-chill permitted the rejection of this null hypothesis. Light and Walker (1991) demonstrated that decision makers who were more

TABLE 32 Correlation between Decision Index and Satisfaction Index

- - Correlation Coefficients - -

	ANAINDEX	SATINDEX
ANAINDEX	1.0000	.9744**
SATINDEX	.9744**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Preceding task required .03 seconds CPU time; .06 seconds elapsed.

satisfied with their decision to select cook-chill had gathered information from a variety of resources. Typically, the less satisfied hospitals had relied on information from three or fewer resources. The results of this study reaffirm that satisfaction with cook-chill is associated with gathering a variety of information from a wide range of resources.

Corollary hypothesis

H3 The extent of use of decision variables in the process of selecting/not selecting cook chill will not have an impact on satisfaction with cook-chill.

The variable component and the satisfaction component had a correlation of .9157 (significant at the <.01 level). Examples of variables considered in the decision to select cook-chill are alternative production systems, percentage of food to be produced by cook-chill, required equipment capacity to meet existing and future demands, the development of test kitchens, adaptation of recipes for cook-chill, and assignment of the task of rethermalizing (reheating) cook-chill foods to serving temperature. This study also supports the work of Light and Walker (1991) who found that the more successful cook-chill operations considered, even if on a superficial basis, the option of a food production alternative other than cook-chill. Less than successful cook-chill operations tended to overlook planning for equipment needs, research and development, and microbiological testing.

Corollary hypothesis

H4 The extent of use of parameters in the process of selecting /not selecting cook-chill will not have an impact on satisfaction with cook-chill.

The parameters component, which has been defined as those measurable aspects of costs of equipment, food, labor, training and related expenses, and satisfaction were found to have a correlation of .9603 (significant at the <.01 level) which permitted rejection of the hypothesis. According to Light and Walker (1991) less than successful cook-chill operations tended to be content to explore potential cost savings without

giving attention to implication of details related to other financial, human, and operational parameters. These issues were often considered after implementation in the less than successful cook-chill operations. Use of the parameters in this study was highly correlated with satisfaction in cook-chill operations.

Corollary hypothesis

H5 The extent of use of calculation of performance measures in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill.

Performance measures, which are precise numerical standards based on the incorporation of parameters, were highly correlated with the satisfaction index (.9649) (significant at the <.01 level) which permitted rejection of this hypothesis. It appeared that those decision makers who became involved with assessing and predicting cost were most satisfied with the final outcome of the decision.

Corollary hypothesis

H6 The extent of use of a computational model which includes variables, param eters, and performance measures in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill.

The computational model which includes use of parameters, variables, and performance measures and a subjective utility assessment was found to be highly correlated (.9677) (significant at the <.01 level) with satisfaction. Based on this correlation, it was possible to reject this hypothesis. The descriptive results of the U.K. Cook-chill Survey, anecdotal cases, and other research done by Light and Walker (1991) supported the hypothesis that overall

successful cook-chill operations used a more systematic, analytical approach to gathering and assessing information. The less successful group were more likely to accept the notion that the cook-chill production process was to cut costs without conducting an in-depth study for the introduction of cook-chill. In this study, the findings of Light and Walker (1991) have been empirically tested with correlations and regression of variables, components, and indices in the generic decision model for the selection of cook-chill for hospital foodservices.

Regression Analysis for Testing the Decision Model

Multiple regression was chosen to test the appropriateness and significance of the model. The high degree of multicollinearity between the components limited the choice of further data analysis 1) to using a stepwise regression and 2) to combining all the decision components into a decision index for regression with the satisfaction index.

Stepwise regression of components.

According to Glass and Hopkins (1984), most behavioral research uses the stepwise multiple regression program to show the increment added by each predictor. In stepwise, the one variable with the highest predictive value is added at each iteration. The cut off point for inclusion in the predictor variables occurs when R squares stop increasing by at least one percent from one variable addition to the next. In this study, stepwise regression resulted in the following regression equation (Table 33):

Satisfaction index= -4.496 +.703 performance component+ 1.06 model component

This formula had an R square of .96 with an F statistics of 101.6 at a significance level of .0001. This equation would permit rejection of the null hypothesis that :

H1 Use of an analytical decision strategy in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill

TABLE 33 Stepwise Regression of Five Decision Components on the Satisfaction Component

```
Variable(s) Entered on Step Number  1..    MODEL

Multiple R            .96770          Analysis of Variance
R Square              .93644                              DF       Sum of Squares
Adjusted R Square     .92938          Regression           1           1421.68581
Standard Error       3.27441          Residual             9             96.49601

                                      F =      132.59794        Signif F =  .0000

------------------ Variables in the Equation ------------------

Variable                B         SE B        Beta          T  Sig T          Mean Square
                                                                              1421.68581
MODEL            1.974813      .171497     .967690     11.515  .0000            10.72178
(Constant)       3.705736     1.471647                  2.518  .0329


Variable(s) Entered on Step Number  2..    PERFM

Multiple R            .98088          Analysis of Variance
R Square              .96212                              DF       Sum of Squares
Adjusted R Square     .95265          Regression           2           1460.67562
Standard Error       2.68110          Residual             8             57.50619

                                      F =      101.60127        Signif F =  .0000

------------------ Variables in the Equation ------------------

Variable                B         SE B        Beta          T  Sig T
                                                                              Mean Square
MODEL            1.063579      .415697     .521175      2.559  .0337           730.33781
PERFM             .703243      .301955     .474410      2.329  .0482             7.18827
(Constant)      -4.496426     3.722243                 -1.208  .2615

                                      * * * *   M U L T I P L E   R E

Equation Number 1    Dependent Variable..   SATIS

End Block Number   1   PIN =     .050 Limits reached.
```

Regression of decision and satisfaction indexes.

The second alternative involved adding all of the five decision components to create a decision index and renaming the satisfaction component to create a satisfaction index. This combining process would alleviate the intercorrelation problem. Regression of the decision index on the satisfaction index would reveal the appropriateness of the model and the Delphi 3 Questionnaire in predicting satisfaction with cook-chill.

The positive direct correlation between the decision index (predictor) and the satisfaction index (criterion) was found to be .977 (significant at the <.01 level) (Table 34). An R square of .949 indicated that the decision index component accounted for 95% of the variatioin in the satisfaction index. A significant t of .0001 and the large F (168.937) statistic allowed for the rejection of the null hypothesis. The null hypothesis stated that:

H1 Use of an analytical decision strategy in the process of selecting/not selecting cook-chill will not have an impact on satisfaction with cook-chill

The regression formula derived from this analysis is:

Satisfaction index= -5.699 + .3528 Decision index

The decision index is comprised of all of the responses to the decision component. The satisfaction index is composed of all the responses to the satisfaction component. In the Phase 3 Questionnaire, there were 105 questions in the decision component and 31 questions in the satisfaction component. Each Delphi panel member was given the option to respond with a "yes" or "no". The total number of "yes" responses in the decision components created the decision index. The total number of "yes" responses to the questions in the satisfaction component created the satisfaction index. A perfect score

TABLE 34 Regression of Decision Index on Satisfaction Index

Equation Number 1 Dependent Variable.. SATINDEX

Descriptive Statistics are printed on Page 47

Block Number 1. Method: Enter

Variable(s) Entered on Step Number 1.. ANAINDEX

Multiple R	.97438
R Square	.94942
Adjusted R Square	.94380
Standard Error	2.92097

Analysis of Variance

	DF	Sum of Squares	Mean Squar
Regression	1	1441.39302	1441.3930
Residual	9	76.78880	8.5320

F = 168.93789 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
ANAINDEX	.352834	.027146	.974382	12.998	.0000
(Constant)	-5.699238	1.906123		-2.990	.0152

the decision index is 105 and on the satisfaction index is 31. Therefore, the regression formula suggests that a score of 37 ("yes" responses) on the decision component of the Phase 3 Questionnaire would account for satisfaction with cook-chill 95% of the time.

The results of this study support the appropriateness and the statistical significance of the application of the generic decision model to the decision to select/not select cook-chill food production in hospital foodservices. In rejecting each of the null hypotheses, the study also suggests that because there is a high correlation between the generic decision model and satisfaction, the more analytical and systematic the decision process, the more likely that satisfaction will be the outcome.

A caveat to these findings, however, is that it must be made clear that the use of the decision model should be systematic and balanced across all five decision components due to the high intercorrelation between components. The high correlations indicate that each component in the model (1)support for the administrative decision process, 2) identification of variables, 3) specification of parameters, 4) determination of the performance measures, 5) use of the computational model, and 6) evaluation of performance) is equally critical to the overall satisfaction with the decision. For example, tendency to focus on *specifying parameters* without *using the parameters* in the computational model, would result in less complete satisfaction with the decision.

Development of Checklist for the Process of Making the Decision

In this research study, opinions of Delphi panel experts regarding the selection and satisfaction with cook-chill food production were used to test a generic model of the decision process of selecting/not selecting cook-chill. The opinions of the experts were gathered to develop the questionnaire that would be used to test the model. When the results of the questionnaire were statistically analyzed within framework of the model, a high correlation was revealed.

Based on these research findings, a "Checklist for the Decision Process of Selecting/Not Selecting Cook-chill for Hospital Foodservices" was developed using the questions from the Delphi 3 Questionnaire. The Checklist consists of a total of 136 questions, 105 questions regarding the decision process and 31 questions regarding satisfaction with the decision process. This Checklist has a variety of applications for decision makers in hospital foodservices who are evaluating cook-chill as a food production alternative. The Checklist could be used: 1) as a planning tool for decision makers just beginning the decision process, 2) as an evaluation tool for decision makers who are currently involved in the process, or 3) as an informative tool for decision makers who have completed the decision , but would like to understand the analytical approach as opposed to the intuitive approach to making decisions.

A decision maker considering cook-chill as a production alternative may use the Checklist as a guide through the decision process. The results of this study showed that the higher the score on the decision process questions (the greater the number of "yes" responses), the greater the satisfaction with cook-chill after installation. A decision maker in this situation might use to Checklist to assure that all aspects of the decision process are given consideration to insure that the decision to select/not select is appropriate for the specific hospital foodservice.

A decision maker currently in the process of making the decision to select/not select cook-chill may use the Checklist to review the thoroughness of the decision process. Based on his review of number of "yes" responses to the decision component, he may find that he needs to explore the decision in greater depth by seeking 1)support for the administrative decision process, 2) identification of variables, 3) specification of parameters, 4) determination of the performance measures, and 5) use of the computational model). These processes could be accomplished by following the Checklist and responding with a "yes" to each of the decision questions.

A decision maker who has already made the decision to select/not select cook-chill may use the Checklist to get a perspective on the nature of an analytical decision process as opposed to an intuitive process. It has been documented in the literature that foodservice managers/administrators have typically used intuition and staff feedback to evaluate the viability of a decison with regard to the foodservice organization (Berger et al. 1987). The nature of the questions in the Checklist suggests the depth of analysis necessary to make a more analytical as opposed to intuitive decision. According to Hill et al. (1978), a decision maker should be able to make a better decision when he can understand the thought process involved in the decision, the personal values place on the decision outcome, and one or two mathematical tools for decision analysis.

Checklist for the Decision Process of Selecting/Not Selecting Cook-chill Food Production for Hospital Foodservices

The process of selecting foodservice production process is complex. As a decision maker, you must consider not only the cost of the equipment, but also the cost of retraining employees, marketing the production process to your customers (employees, patients, visitors), renovating your facility (if necessary), and many other critical issues.

An investment in cook-chill technology can represent a sizeable sum to your hospital. The attached "Checklist" is a guide to making your decision to select/not select cook-chill. This "Checklist" and the model of the decision process can help make the decision process more analytical as opposed to intuitive. A study has shown that the more analytical the decision process, the more satisfied the user of the cook-chill technology.

This "Checklist" is not a quiz, but rather a framework for assessing your operation, using the information you gather in the decision process, predicting your operational performance with cook-chill, and finally being satisfied with a well planned decision process. Respond with a "yes" or "no" to each of the statements on the "Checklist."

Checklist for the Decision Process of Selecting/Not Selecting Cook-chill for Hospital Foodservices

Have you given consideration to becoming a profit center by selling cook-chill prepared foods to:	YES	NO
1. other hospitals?		
2. nursing homes?		
3. elderly feeding programs ?		
4. schools?		
5. day care centers ?		
In the process of gathering information to make the decision to select or not select cook-chill, have you consulted ?		
6. foodservice consultants		
7. foodservice equipment suppliers		
8. manufacturer representatives		
9. other cook-chill users		
10. industry journals*		
11. professional journals**		
12. seminars/conferences		
* For example Restaurant&Institutions, Restaurant Business, Hospitals, etc. ** For example Food Technology, Journal of the American Dietetic Association, Journal of Foodservice Systems, etc		

	YES	NO
13. In the process of analyzing the decision have financial calculations (such as food cost percentage, total dietary expense, net present value, payback period, etc.) been made?		
If yes, were the calculations made by: 14. an outside consultant?		
15. a sales representative?		
16. a manufacturer representative?		
17. the hospital accounting office?		
18. the hospital foodservice administrator?		
Did the person responsible for the calculations: 19. calculate the hospital foodservice food cost percentage before cook-chill?		
20. calculate the projected hospital food cost percentage after cook-chill?		
21. calculate the total dietary expense percent before cook-chill?		
22. calculate the projected total dietary expense percent after cook-chill?		
23. calculate the total dietary salary expense before cook-chill?		
24. calculate the projected total dietary salary expense after cook-chill?		

Did the person responsible for the calculations (continued):	YES	NO
25. calculate the foodservice labor cost percentage before cook-chill?		
26. calculate the projected foodservice labor cost percentage after cook-chill?		
27. calculate total meals served per labor hour before cook-chill?		
28. calculate projected total meals served per labor hour after cook-chill?		
29. calculate the break-even point (where sales and expenses are equal with zero profit) for the hospital foodservice with cook-chill?		
30. calculate the net present value of the dollar investment in installation of cook-chill?		
31. calculate the return on investment (ROI) in cook-chill?		
32. calculate a payback period for the investment in cook-chill?		
When financial calculations were made available , did you:		
33. use the hospital food cost percentage as a reason for deciding to select/not select cook-chill?		
34. use the total dietary expense as a reason for deciding to select/not select cook-chill?		
35. use total dietary salary expense per meal as a reason for deciding to select. not select cook-chill?		
36. use the foodservice labor cost percentage as a reason for deciding to select. not select cook-chill?		

When financial calculations were made available to you, did you(continued):	YES	NO
37. use the total meals served per labor hour as a reason for deciding to select/not select cook-chill?		
38. use the break-even point as a reason for deciding to select/not select cook-chill?		
39. use the net present value of the investment in cook-chill as a reason for deciding to select/ not select cook chill?		
40. use the return on the investment in cook-chill as a reasons for deciding to select/not select cook-chill?		
41. use the projected payback period as a reason for deciding to select/not select cook-chill?		
In the analysis that led to the decision to select/not select, did you: 42. assess the quality of food served before cook-chill?		
43. predict the quality of food served after cook-chill?		
44. use quality assessments before and/or after cook-chill as reasons for deciding to select/not select cook-hill?		
45. assess the consistency of food served before cook-chill?		
46. predict the consistency of food served after cook-chill?		
47. use consistency assessments before and/or after cook-chill as reasons for deciding to select/not select cook-chill?		

In the analysis that led to the decision to select/not select, did you(continued):	YES	NO
48. evaluate customer satisfaction with foods served before cook-chill?		
49. predict customer satisfaction with foods served after cook-chill?		
50. use customer satisfaction evaluations before and/or after cook-chill as reasons for deciding to select cook-chill?		
51. record amount of food wastage before cook-chill?		
52. predict the amount of food wastage after cook-chill?		
53. use food wastage before and/or after cook-chill as reasons for deciding to select/not select cook-chill?		
54. monitor food holding temperatures before cook-chill?		
55. predict food holding temperatures after cook-chill?		
56. use food holding temperatures before and/or after cook-chill as reasons for deciding to select/not select cook-chill?		
57. monitor food storage time before cook-chill?		
58. predict food storage time after cook-chill?		
59. use food storage times before and/or after cook-chill as reasons for deciding to select/not select cook-chill?		

Have you calculated the cost of cook-chill to include:	YES	NO
60. cost of equipment?		
61. cost of installation?		
62. cost of facility renovation?		
63. cost of employee training?		
64. cost of installing and updating floor pantries?		
65. cost of installing or updating test kitchen?		
66. cost of rethermalization (reheating) equipment?		
67. cost of delivery equipment?		
68. Did you consider the shortage of skilled food production labor in the geographic region considered?		
69. Did you consider the abundance of food production labor in the geographic region considered?		
70. Was money budgeted to cover the cost of staffing a test kitchen?		
71. Were plans made for a reduction in number of foodservice employees on staff?		
72. Was the standard number of patients per foodservice employee calculated? (FTE)		
73. Was the number of minutes of labor required to serve one meal to one person calculated?		

Was attention given to food safety through:	YES	NO
74. regular sanitation training for foodservice employees?		
75. monitoring of food production techniques?		
76. monitoring of food storage times?		
77. monitoring of food storage temperatures?		
78. monitoring of food holding times?		
79. monitoring of food holding temperatures?		
80. monitoring of food temperature at time of service?		
81. examining bacteria content of food samples?		
82. Was monthly food cost percentage calculated based on monthly inventory figures?		
83. Was food waste due to over production and theft recorded?		
84. Were customer satisfaction surveys given at regular intervals?		
85. Were patient satisfaction surveys given at regular intervals?		
86. Was customer feedback gathered through suggestion boxes?		
87. Were food acceptance records maintained to determine the amount of food consumed by the patients?		
88. Were standard recipes for all menu items available in the production areas?		

	YES	NO
89. Were standard recipes routinely followed?		
90. Were standard food portioning tools available at each point of service?		
91. Were standard food portions served at each point of service?		
In the process of making the decision to select/not select cook-chill, did you consider:		
92. convenience (prepared) foods an alternative?		
93. cook-freeze food production as an alternative?		
94. blast chill versus tumble chill as a procedure for quick chilling foods?		
95. the percentage of menu items which could be prepared by cook-chill?		
96. the capacity of cook-chill equipment needed based on the existing food production demand?		
97. the capacity of cook-chill equipment needed based on the projected food production demand?		
98. the need for a food product test kitchen with cook-chill?		
99. the need for recipe testing prior to implementing cook-chill?		
100. the need to develop new recipes for cook-chill?		
101. the need to adapt and test existing recipes for cook-chill?		

	YES	NO
102. the need to establish that dietary staff would be responsible for rethermalizing (reheating) food and for tray delivery?		
103. the need to establish that nursing staff would be responsible for rethermalizing (reheating) food and for tray delivery?		
104. Did the decision maker(s) visit other cook-chill production facilities during the decision process?		
105. Did the visit(s) have an impact on their decision?		
106. Have the decision maker(s) been satisfied with the decision to select cook-chill technology?		
If *the you made the decision to select cook-chill, are you satisfied with:*		
107. the extent to which production employees have applied their cook-chill production training?		
108. the extent to which service employees have applied their training in reheating chilled foods?		

If you made the decision to select cook-chill, are you satisfied with	YES	NO
the level of accpetance of the cook-chill system:		
109. by the patient?		
110. by the non-patient customer?		
111. by the foodservice staff?		
112. by the nursing staff?		
113.. by the administrative staff?		
114. by the medical staff?		
the level of acceptance of quality of foods prepared with the cook-chill system: 115. by the patient?		
116. by the non-patient customer?		
117. by the foodservice staff?		
118. by the nursing staff?		
119. by the administrative staff?		
120. by the medical staff?		
121. the ability to reduce food wastage through eliminating over production?		
122. the ability to reduce food spoilage through adhering to controlled production techniques?		
123. the ability to reduce food spoilage through adhering to controlled food storage times ?		
124. the ability to reduce food spoilage through adhering to controlled food storage temperatures?		

If you made the decision to select cook-chill, are you satisfied with:	YES	NO
125. the ability to reduce food spoilage through adhering to controlled food holding times?		
126. the ability to reduce food spoilage through adhering to controlled food holding temperatures?		
127. the ability to reduce food spoilage through examining bacteria content of food samples?		
128. the food cost percentage after introduction and implementa tion of cook-chill?		
129. the total dietary salary expense per meal after the introduc tion and implementation of cook-chill?		
130. the foodservice labor cost percentage after the introduction and implementation of cook-chill?		
131. the total meals served per labor hour after the introduction and implementation of cook-chill?		
132. the use of break-even point as a reason for deciding to select/not select cook-chill?		
133. the use of net present value as a reason for deciding to select/not select cook-chill?		
134. the use of return on investment in cook-chill as a reason for deciding to select/not select cook-chill?		
135. the use of projected payback period as a reason for decidingto select/not select cook-chill?		
136. total actual investment in cook-chill?		
TOTAL RESPONSES		

Assessing Your Decision to Select Cook-chill

The first 105 items on the checklist represent elements of the decision process while the next 31 represent satisfaction level. Total the number of "yes" responses in the first 105 items. If your number of "yes" responses is greater than 37, your strategy is making the decision to select/not select has been analytical. If your score is less than 37, your decision strategy has been more intuitive.

If you made the decision to select cook-chill and have it operating, you might find it interesting to look at your satisfaction score. This score is the sum of the "yes" responses to the last 35 questions on the Checklist. A satisfaction score of 31 is considered to be the minimum desirable according to a panel of experts on cook-chill technology in hospital foodservices.

In every decision process, there are intuitive and analytical components. The purpose of this Checklist is to provide a potential purchaser of cook-chill an unbiased guide for the decision. The decision process consists of administrative decision support, variables, parameters, performance measures, and a computational model. The key to using this Checklist is to be aware that you should use a wide variety of diverse measures in the decision process. All of the items on the Checklist were considered important by the group of experts.

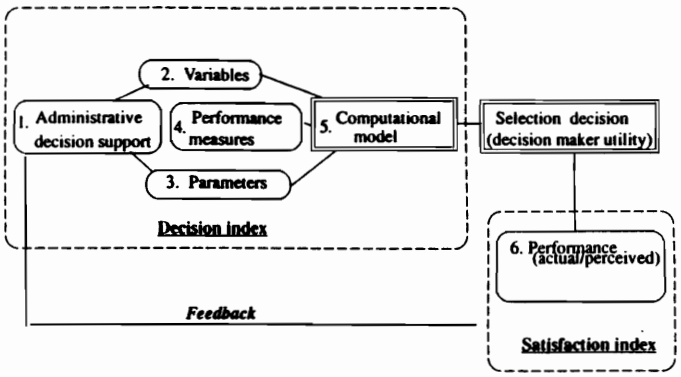


FIGURE 17 Generic Model of the Decision Process to Select /Not Select Cook-chill Food Production for Hospital Foodservices

CHAPTER 5

SUMMARY AND CONCLUSIONS

Purpose of Study

The major purpose of this study was to develop and test a model for the decision process of selecting/not selecting cook-chill food production technology in hospital foodservices. An additional purpose was to examine the analytical versus intuitive decision strategy of decision makers who are satisfied with their decision regarding the selection of cook-chill food production for hospital foodservices.

Summary

Because of the lack of empirical research in foodservice systems and, more particularly, on the decision process of selecting cook-chill food production, a generic model of a decision process was designed based on a review of decision theory literature. A modified Delphi technique was used to elicit the opinions of a panel of experts regarding the decision process in the selection of cook-chill. Opinions of the expert panel were integral in the development of the final instrument and testing of the generic decision model for the selection of cook-chill technology in hospital foodservices. Although the opinions of over fifteen (15) experts were incorporated in the first two phases of the Delphi technique, eleven (11) of the Delphi panel participated fully in all three phases. Included in this sample were foodservice administrators and dietitians from contract management as well as self operating hospital foodservice operations. The Delphi panel had been involved in a total of 88 processes of the decision to select/not select cook-chill for private, public, and teaching hospitals across the United States. Eight (8) of the eleven (11) participants in the Delphi technique are currently actively involved in a hospital cook-chill foodservice operation.

Over the three phases of the Delphi technique, the expert panel listed their opinions on the decision factors and success characteristics of a cook-chill operation. The opinions were grouped and condensed into statements. The panel then used a Likert scale to rank the importance of each of the statements regarding factors and characteristics of a successful cook-chill operation. The ranking of the decision factors and success characteristics provided the basis for the content of the questions in the final questionnaire.

Identifying Variables

The final instrument which consisted of 157 questions provided both descriptive and dichotomous responses about the decision process of selecting/not selecting cook-chill production and characteristics of a successful operation. The 136 responses from the final survey represented thirteen(13) variables that measured specific aspects of the decision process (105 questions) and success characteristics (31 questions). The thirteen (13) variables measuring specific aspects in the decision model were grouped into the six (6) components of the decision model (Figure 17)

Developing Components and Indices

The five (5) primary decision components and one (1) satisfaction component in the generic decision model were identified based on an extensive review of decision theory literature. Five predictor (independent) components of the model were: administrative decision support, variables, parameters, performance measures, and the computational model. The one criterion (dependent) component of the model was satisfaction which was based on the perception and assessment of the actual performance of the cook-chill production technology. The decision components were then grouped into a decision index and the satisfaction component was converted to a satisfaction index.

Correlations and Regression Analyses

Correlations between the decision (predictor) components and the satisfaction (criterion) component were computed. There was a positive correlation between the decision components and satisfaction component. Stepwise multiple regression of the individual decision components on the satisfaction component showed correlations were so high that only two predictor components need be included in the regression equation.

Regression of the decision and satisfaction indices demonstrated that the model was appropriate and was statistically significant. By using the Delphi 3 Questionnaire to test the model of the decision process, it became clear that a high score (number of "yes" responses) on the decision component questions was correlated with a high score (number of "yes" responses) on the satisfaction component questions.

Assessment of Decision Strategy

The decision index score respresented the sum of the "yes" responses to the questions regarding the five decision components in the model. The highest number of possible responses in the decision component was 105. The possible range of decision index scores was from highly analytical (105) to highly intuitive (0). The satisfaction index score represented the sum of the "yes" responses to the questions regarding satisfaction with cook-chill. The highest number of possible responses in the satisfaction component was 31. The possible range of satisfaction index scores was from 31 (highly satisfied) to 0 (highly unsatisfied).

Literature has supported that the more information used in a decision process, the more analytical the decision process (Nutt, 1989). In uncertain environments where little information is available for decision making, the nature of the decision strategy is more intuitive, that is, based on "gut feeling" or intuition. A high number of "yes' responses to questions measuring the decision indices of the generic model signifies a high availability

and use of information in the decision process. A lower score on the questions measuring the decision index of the generic model signified that information availability and use in the decision process was low. When information is limited the decision strategy tends to be more intuitive.

There was a positive direct relationship between high decision index (highly analytical) and a high satisfaction index (greater satisfaction). Statistically, it was shown that a decision index score of 37 on the Phase 3 Questionnaire was the minimum score for predicting satisfaction in 95% of the decisions to select cook-chill. Therefore, the more analytical the decision process, the greater the satisfaction with cook-chill.

Objectives

The results of this study have lead to the accomplishment of the original objectives:

1. To develop a generic model for decision process of selecting/not select ing cook-chill food production for hospital foodservices
2. To test the generic model for appropriateness and statistical significance for use in the decision process to select/not select cook-chill food production in hospital foodservices
3. To determine the decision strategy, analytical versus intuitive, most predictive of satisfaction with the decision to select/not select cook-chill food production in hospital foodservices

Conclusions

The primary conclusion of this study is that there is a relationship between the decision process in the selection of cook-chill and the final satisfaction with cook-chill food production. The analytical versus intuitive strategies used in the multicriteria decision do have a direct impact on ultimate satisfaction with the decision. High correlation between decision components and satisfaction components suggests a positive linear relationship indicating that the more analytical the decision process, the greater chance of satisfaction. The less analytical, the lower the chance of satisfaction.

The results of this study suggest that the Phase 3 Questionnaire would provide the basis for a Checklist for foodservice administrators involved in the process of making the decision to select cook-chill. A "Checklist for the Decision Process of Selecting/Not Selecting Cook-chill for Hospital Foodservices" was developed using the questions from the Phase 3 Questionnaire. The purpose of the Checklist is to provide a guide for the decision process. This Checklist has a variety of applications for decision makers in hospital foodservices who are evaluating cook-chill as a food production alternative. It could be used: 1) as a planning tool for decision makers just beginning the decision process, 2) as an evaluation tool for decision makers who are currently involved in the process, or 3) as an informative tool for decision makers who have completed the decision , but would like to understand the analytical approach as opposed to the intuitive approach to making decisions.

The Checklist consists of a total of 136 questions, 105 questions regarding the decision process and 31 questions regarding satisfaction withcook-chill. A decision maker would respond to the questions on the Checklist with a "yes" or "no" answer. The total number of "yes" responses to items 1 through 105 provides a decision index. A decision index of 37 or greater predicts greater satisfaction with the final decision of selecting/not selecting cook-chill.

In this study, the Delphi research technique provided the basis for the development of a questionnaire to test the generic model of the decision process. The Delphi technique involves a polling and conferencing process which incorporates the collective judgment of experts. The experts involved in this study had been involved in the process of making the decision to select/not select cook-chill in over 88 foodservice operations. Based on these facts, it is expected that the model and Checklist have extensive application.

Significance

A generic model of the decision process and the "Checklist for the Decision Process of Selecting/Not Selecting Cook-chill for Hospital Foodservices" were developed and tested in the research . The results present a systematic decision making guide for decision makers in the foodservice industry where it has been documented that many decisions are made intuitively (Berger et al. 1987; Ferguson and Selling, 1985) as opposed to analytically. Systematically examining administrative decision support, variables, parameters, performance measures, and using computational models has been shown to be postively correlated with satisfaction with cook-chill production. Since that little attention has been given to the development of decision strategies for use by foodservice administrators, there are few predictive models for decision making in foodservices (Spears, 1976; Matthews, 1982a & b). Because of the uncertain nature of the foodservice environment which involves competitors, suppliers, buyers, alternative products, today's foodservice administrator must be able to make decisions that will enhance the performance of the foodservice operation. The lack of resources and empirical research have made it difficult to be confident of the allocation of large amounts of capital for introduction of new procedures and technologies. The basis for this research is the contention that decision makers should be able to make better decisions when they

can understand the *process* involved in the decision (Hill et al. 1978). The purpose of this research was to provide insight into the process of making the decision to select/not select cook-chill food production in hospital foodservices.

Limitations

The model of the decision process and the Checklist in this study have application for making the decision to select/not select cook-chill food production for hospital foodservices. The results of this research are not intended to be a comprehensive guide, but rather a systematic framework for decision making that is highly correlated with ultimate satisfaction with cook-chill technology. Recommendation of cook-chill food production over other food production alternatives was not the intent.

The prescriptive, generic model for assessing the analytical versus intutive aspects of the decision strategy should apply to all cook-chill selection processes. Because of the uniquely different characteristics of foodservices in hospitals, colleges/universities, schools, business and industry, and military, it was the researcher's decision to focus specifically on hospital cook-chill foodservices. It is expected that the results may applied to a larger population of hospitals due to the extensive experience of the eleven experts in the selection, implementation, and use of cook-chill food production. The Checklist may need to be modified depending on the category of foodservice (schools, colleges/universities, business and industry, military, etc) considering the selection of cook-chill. It is suggested that individual assessments of the appropriateness of cook-chill for each individual category of food production site be made separately (Light and Walker, 1991).

Recommendations

The demand for increased productivity through increased operational efficiency and decreased costs is not limited to the healthcare segment of the foodservice industry. Although this model was developed and tested for use in hospital foodservices, it can apply equally well to the proces of making the decision to select/not select cook-chill in college/universities, schools, business and industry, and military foodservices. The application of management science decision making principles to foodservice decisions can only serve to improve decision making skills which have been heretofore primarily intutive (Berger et al. 1987).

Although the sophistication of multicriteria decision making methods has increased, it is the tendency of decision makers to choose the less sophisticated decision making methods. It has been shown that the use of decision technology improves actual decision making, however, it has been suggested that use of decision aids also increases decisional conflict. Kottemann and Davis (1991) have explained the theoretical basis for user preferences through introduction of the term "decision conflict." Decision conflict occurs when the decision aid indicates one decision choice while intuition suggests another. In many instances, decision aids require information that is not readily available (Herz and Souder, 1979) and a time and financial commitment (Light and Walker, 1991; Freshwater, 1980) that is not feasible. The end result is that the decision maker choses to *not* use the decision aid.

In this study, a generic model for the decision process of selecting/not selecting cook-chill was tested, developed, and found to be significant. The responses of the Delphi experts to the Phase 3 Questionnaire were statistically analyzed for the purposes of tesing the model. Based on the correlations and regressions, the model was found to a significant predictor of satisfaction with cook-chill. The higher the decision index, the

number of "yes" responses to statements regarding the first five components of the generic model, the higher the expected satisfaction. Based on this premise, a decision maker would be able to monitor the decision process to assure that the model is followed. According to the regression equation, a mimimum score of on the 37 decision index would predict satisfaction in 95% of the decision processes. The score is based on the number of "yes" responses to questions in the decision index.

Therefore, the format of the Phase 3 Questionnaire when modified becomes a "Checklist for the Decision Process of Selecting Cook-chill Food Production in Hospital Foodservices." This instrument, can be used as a guide in the decision process and as a tool for interpreting the decision strategy of the decision makers responsbile for the decision. The number of "yes" responses in the decision index questions would be highly correlated with satisfaction with the decision. These "yes" responses should be somewhat evenly distributed across the five components because of the high correlation between the components.

The design of the decision aid will determine the decisional conflict and the ultimate use of the aid. In order to alleviate or reduce decisional conflict, it is suggested that the decision aid generate a number of efficient alternatives from which the decision maker may chose as opposed requiring the decision maker to make explicit tradeoff judgments (Kottemann and Davis, 1991). The generic decision model developed and tested in this study does not require that tradeoffs be made, but rather suggests a prescriptive decision framework. Use of the Checklist provides the decision maker a guide for the decision process. The number of "yes" responses on the "Checklist for the Decision Process of Selecting Cook-chill Food Production in Hospital Foodservices" will indicate to the decision maker the chances of the decision process resulting in ultimate satisfaction with cook-chill food production. The Checklist can also be used to evaluate the nature

of the decision strategy used. Both the model and the "Checklist for the Decision Process of Selecting Cook-chill Food Production in Hospital Foodservices" provide a user friendly decision guide for a decision maker who must make the multicriteria complex decision of selecting/not selecting cook-chill food production technology for use in a hospital foodservice.

Future Research

The area of foodservice systems is replete with research opportunities due to the obvious lack of empirically based studies (Green and Weaver, 1990; Light and Walker, 1991; Matthews, 1982a & b). Foodservice systems research will continue to get more attention as cost control continues to be one of the primary challenges of the both commerical and non-commerical foodservice organizations.

The generic model and Checklist in this study were developed on the basis of hospital foodservices. A follow-up study would be to select and interview a sample of foodservice administrators and dietitians who have not been satisfied with cook-chill food production to determine any differences in the decision process and the decision strategy. Cook-chill food production is a technology that applies well to other categories of foodservices. Testing of this model in other operations such as schools, colleges/ universities, and military operations may provide insight into the differences in how the decision process should be managed. Another area not addressed by this research project is the impact of management style on satisfaction and acceptance of cook-chill by employees and customers. The attitude and approach of foodservice administrators can be a strength or weakness during the introduction of new technology. Cook-chill may be more successful in those operations who assume the prospector strategy as opposed to the defender, analyzer, or reactor.

Foodservice research offers many challenges for education and industry to collaborate on issues of concern in the areas of human resources, marketing, administration finance, operations, and R&D. This study is the initial attempt of the researcher to apply conceptual principles of decision science to a complex decision process in hospital foodservice operations. Research with a blend of conceptual underpinnings as well as human and/or technical components will be appropriate for future exploration.

BIBLIOGRAPHY

BIBLIOGRAPHY
(cited in text)

Aguilar, F. J. (1967). Scanning the business environment. New York, New York: MacMillan Publishing Company.

American Hospital Association. (1990). American Hospital Association Hospital Statistics, 1990-91 Edition. Chicago, Illinois: American Hospital Association.

Badinelli, R. D. & Baker, J.R. (1990). Multiple attribute decision making with inexact value-function assessment. Decision Science, 21(2), 318-336.

Bean, R. L. (1983). Cook and refrigerate versus cook and freeze. The Consultant, 16(2).

Bean, R . L . (1985) . System, system, who's got the system? The Consultant, 18(2).

Bengtsson, N . & Dagersbog, H . (1978). Fried meat and meat patties.the influence of preparation and processing on quality and yield. In K . Paulus (Ed.) , How Ready Foods are Ready Foods. New York: S. Karger.

Berg, C . C . (1986). Aspiration level adaptation of members within project groups. In E . Witte & J . J. Zimmerman, (Eds.) , Empirical research on organizational decision making. London, England: Elsevier Science Publishers.

Berger, F. , Ferguson, D . H . , & Woods, R . (1987). How restauranteurs make decisions. Cornell Hotel Restaurant Administrations Quarterly, 27(4) , 48-57.

Berkman, J. (1980). Food service needs controls to contain costs. Hospitals, 54(6), 79-82.

Bieri, J. (1961). Complexity-simplicity as a personality variable in cognitive and preferential behavior. In Fisk & Maddi (Eds.), Functions of a varied experience. New York: Dorsey Publishing.

Bonge, J . W . (1972). Problem recognition and diagnosis: Basic inputs to business policy. Journal of Business Policy, 45-53.

Brady, J. (1988). Development of facilities standards for accreditation of baccalaureate degree programs in hospitality management education. Unpublished doctoral dissertation. Vanderbilt University, Nashville, Tenneessee

Bryan, L. & Fritz, M. (1976). Increasing employee prodcution and patient satisfaction. Hospitals, 50 (1), 125-128.

Buchanan, R . D . (1974a). Two market studies reveal convenience food attitudes and usage, Part I. Food Service Marketing, April, 51-59.

Buchanan, R .D . (1974b) . Two market studies reveal convenience food attitudes and usage, Part II. Food Service Marketing, March, 51-58.

Bureau of Foodservice Research. (1990). Foodservice Forecast 1991. Restaurants and Institutions Magazine, November.

Burns, T. & Stalker, G.M. (1961). The management of innovation. London, England: Tavistock Publishing.

Carroll, G . H . (1980). Labor time comparison of a cook-freeze and cook-serve system of food production. Journal of Canadian Dietetic Association, 40(1), 39-49.

Carroll, G . H . (1981). Case histories: a bulk pack chilled/frozen production system for a 500 bed hospital. Journal of Foodservice Systems, 1, 51-67.

Child, J. (1972). Organizational structure, environment, and performance: The role of strategic choice. Sociology. 6, 1-22.

Cipolla, M . M . (1990). Foodservice operators need systems for profitability, efficiency, and quality. The Consultant, 23(2).

Coffey, J.C. (1972). Productivity: The problem and what to do about it. Proceedings of the 38th Conference of the Society for the Advancement of Food Service Research.

Coltman, M. (1979). Financial management for the hospitality industry. New York: Van Nostrand Reinhold.

Coltman, M . (1987). Hospitality management accounting. New York: Van Nostrand Reinhold.

Crimmins, M.B. (1982). Foodservice in the hospital corporation. Food Management. 17 (11), 41-42.

Cyert, R. M. & MacCrimmon, K.B. (1968). Organizations In E. Aronson and G. Lindzey, (Eds.), The Handbook of Social Psychology. 2nd ed. Reading, Mass: Addison-Wesley.

Cyert, R . M. & March, J. G. (1963). A behavioral theory of firms. Englewood Cliffs, New Jersey: Prentice Hall.

Daft, R .L . (1989). Organization theory and design. New York: West Publishing Company.

Dahl, C . A . (1982). Effect of meal asembly, meal distribution, and meal service on sensory qualities of food. In M . E . Matthews & C . Norton (Eds.) Hospital patient ready foods systems. Washington D.C. : National Academy Press.

Dewey, J. (1933). How we think. new ed. Boston, Massachusetts: D.C. Heath.

Donaldson, B . (1957). Labor hours in the dietary department. Journal of the American Dietetic Association, 33(12), 1239-1243.

Donaldson, B. (1971). Food service. Hospitals, 45, 81-84.

Driver, M . J . & Mock, T . J . (1975). Human information processing, decision style theory and accounting information systems. The Accounting Review, 7, 490-508.

Drucker, P. F. (1971). What can we learn from Japanese management. Harvard Business Review, 49(2), 110-122.

Emory, C. & Niland, P. (1968). Making management decisions. Boston, Massachusetts: Houghton Miffilin.

Escueta, E . S ., Fiedler, K . M . , & Reisman, A . (1986). A new hospital foodservice classification system. Journal of Foodservice Systems, 4, 107-116.

Ferguson, D . H . & Selling, T . I . (1985). Probability analysis: a system for making better decisions. Cornell Hotel Restaurant Administration Quarterly, 26(2), 35-42.

Ford, J. D. & Slocum, J. W. (1977). Size, technology, environment and the structure of organizations. Academy of Management Review, 2, 561-575.

Franzese, R . (1981a). Food service systems of 79 hospitals studied. Hospitals, 55(3), 64-66.

Franzese, R . (1981b). Survey examine hospitals' use of convenience foods. Hospitals, 55(2), 109-112.

Franzese, R . (1984). Food services survey shows delivery shift. Hospitals, 58(16), 61-66.

Freshwater, J. F. (1980). Least-cost hospital foodservice systems. Marketing Research Report No. 1116, Agriculture Marketing Service, USDA.

Glass, G. V. and Hopkins, K.D. (1984). Statistical methods in education and pyschology. Second edition. Englewood Cliffs, New Jersey: Prentice Hall.

Glew, G . (1973). The technology for improved service. Hospitals, 47 (21), 51-53.

Goldberg, C . M . & Kohiligian, M . (1974). Conventional, convenience or ready food service ? Hospitals, 48(8), 80-83.

Goldsmith, J.C. (1980). The health care market: Can hospitals survive? Harvard Business Review, October, 967-969.

Greathouse, K . R . & Gregoire, M . B . (1988). Variables related to selection of conventional, cook-chill, and cook-freeze systems. Journal of the American Dietetic Association, 88(4), 476-478.

Greathouse, K .R , Gregoire, M . B. , Spears, M . C ., Richards, V . & Nassar, R . J . (1989). Comparison of conventional, cook-chill, and cook-freeze systems. Journal of the American Dietetic Association, 89(11), 1606-1611.

Green, C. & Weaver, P. A. (1990). The use of statistics in foodservice systems research. Unpublished manuscript. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Harder, E . J . (1972). Convenience foods decision: no! Hospitals, 47(1), 76-80.

Harper, J. M. , Jansen, G . R . , Shigetomi, C . T . & Fallis, L . K . (1972). Pilot study to evaluate food delivery systems used in school lunch programs I. Menu item acceptability. School Foodservice Research Review, 1(1) 20-24.

Herz, M . L . & Souder, J . J . (1977). Preparation systems have significant effect on costs. Hospitals, 51 (1), 89-92.

Hill, P.H., Beadeau, H . A ., Chechile, R . A . , Crochertiere, W . J . , Kellerman, B. L., Ounjian, D . , Pauker, S . G . , Pauker, S . P . , & Rubin, J . Z . (1978). Making decisions: A multidisciplincary introduction. Reading, Massachusetts: Addison-Wesley Publishing Company.

Hough, L. (1970). Modern research for administrative decisions. Englewood Cliffs, New Jersey: Prentice Hall.

Hudson, L . (1966). Contrary Imaginations . New York: Schochen Books.

Hysen, P . & Harrison, J . (1982). State-of-the art review of healthcare patient feeding systems equipment. In M . E . Matthews & C. Norton (Eds.), Hospital patient ready foods systems. Washington D.C. : National Academy Press.

Jones, P . & Heulin, A .(1990). Foodservice systems- generic types, alternative technologies and infinite variation. Journal of Foodservice Systems, 5, 299-311.

Kaud, F . A . (1972). Implementing the chilled food concept. Hospitals, 46 (15), 97-100.

Keeney, R . L . & Raiffa, H . (1976). Decisions with multiple objectives: Preferences, values, and tradeoffs. New York: Wiley & Sons.

King, P. (1989a). Meeting a need efficiently. Food Management, 24(3), 52-55. .

King, P. (1989b). The future of central production? Food Management, 26(3), 61-64.

King, P.(1989c). Producing in a less costly foodservice. Food Management, 23(6), 54-57.

Kolb, D . A ., Rubin, I . M . & Osland, J . S . (1991). The organizational behavior reader. Englewood Cliffs, N.J.: Prentice Hall.

Koncel, J . A . (1976). Planning pervaded conversion to cook/chill system. Hospitals, 50(22), 87-92.

Koncel, J A . (1977). Food service has vital role in overall hospital operations. Hospitals, 51 (16), 111-114.

Koogler, G . H . & Nicholanco, S . (1977). Analysis of a decision framework for prepared food systems. Hospitals, 5(4), 95-98.

Kottemann, J. S. & Davis, F. D. (1991). Decisional conflict and user acceptance of multicriteria decision making aids. Decision Science, 22, 918-926.

Light, N . & Walker, A . (1991). Cook-chill catering: Technology and management. London, England: Elsevier Applied Science.

Lindblom, C.E. (1959). The science of muddling through. Public Administration Review. Spring, 77.

Linstone, H.A. & Turoff, M. (1975). The Delphi method techniques and applications. Reading, Massachussets: Addison-Wesley.

Lippe, D . (1983). Evaluation can be keen weapon for defending capital purchase. Modern Healthcare, 13 197-202.

Lyman, W . A . (1981). Cook-chill system for food service operations. Proceedings of the 37th Conference of The Society for the Advancement of Foodservice Research.

Mc Kenney, J . L . & Keen, P. (1974). How manager's minds work. Harvard Business Review, 52(3), 79-80.

March, J . G . & Weissinger-Baylon, R. (1985). Introduction, ambiguity and command: Organization perspective on military decision making. Unpublished manuscript, Boston, Pittman Publishing, Incorporated. May 1985.

Matthews, M . E . (1975). Productivity studies reviewed, trends analyzed. Hospitals, 49 (12), 81-84.

Matthews, M . E . (1982a). Foodservice in health care facilities. Food Technology, 36 (7), 53-71.

Matthews, M . E . (1982b). Hospital patient feeding systems. Washington D.C.: National Academy Press.

Meyer, M. K. (1986). A productivity analysis of the dietitian as a health care team member in the service section. Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Miles. R. E. & Snow, C. C. (1978). Organizational strategy, structure, and process. New York: McGraw Hill.

Mill, R. C. (1989). Productivity in service organizations. In P.Jones (Ed.), Management in service industries. London: Pitman Publishing.

Mintzberg, H., Raisinghani, D. & Theoret, A. (1976). The structure of "unstructured" decision processes. Administrative Science Quarterly, 21, 246-275.

Morey, R. V. & Valentine, N. E. (1980). Simulation of two decentralized hospital food reconstitution systems. Journal of Foodservice Systems, 1, 99-114.

Murray, M. (1986). Decisions: a comparative critique. DePaul University: Pitman Publishing.

Nanus, B. & Lundberg, C. (1988). In quest of strategic planning. Cornell Hotel Restaurant Administration Quarterly, 29(2), 18-23.

Nutt, P. C (1986). Decision style and strategic decision of top executives. Technological Forecasting and Social Change, 30, 39-62.

Nutt, P. C. (1989). Making tough decisions. San Francisco, California: Jossey-Bass Publishers.

Parten, M. (1950). Survey, Polls, and Samples. New York: Harper & Brothers.

Pearce, J. A. & Robinson, R. Jr. (1988). Strategic management: Strategy formulation and implementation. Homewood, Illinois: Irwin Publishers.

Pickens, C.W. & Shanklin, C.W. (1985). State of the art in marketing in hospital foodservice departments. Journal of the American Dietetic Association, 85(11), 1474-1478.

Porter, M. (1980). Competitive strategy. New York: Free Press.

Pounds, W. F. (1969). The process of problem finding. Industrial Management Review, Fall, 1-19.

Radford, K. J. (1977). Complex decision problems : an integrated strategy for resolutions. Reston, Virginia: Reston Publishing.

Radomsky, J. (1967). The problem of choosing a problem. Unpublished M.S. thesis, Sloan School of Management, Massachusetts Institute of Technology, Boston, Mass.

Rappole, C. L. (1973). Institutional use of frozen entrees. Cornell Hotel Restaurant Administration Quarterly, 14(1), 72-99.

Reed, R. M. (1973). Conventional system may be best. Hospitals, 47 (14),161-62.

Reid, V .(1973). Convenience foods decision, yes! Hospitals, 47 (2), 81-84.

Ridley, S . J . , Matthews, M . E ., & McProud, L . M . (1984). Labor time code for assembling and microwave heating menu items in a hospital galley. Journal of the American Dietetic Association, 84(6), 648-654.

Rinke, W . J . (1976). Three major systems reviewed and evaluated. Hospitals, 50(4), 73-78.

Rose, J . C . (1980). Containing the labor costs of foodservice. Hospitals, 54(6), 93-98.

Rose, J . C . (1986). A candid view of the hospital market. Proceedings of the 42nd Conference of The Society for the Advancement of Foodservice Research.

Rosenstein, A . H . (1986). Hospital closure or survival formula for success. Healthcare Maintenance Review, 11(3), 29-35.

Ruf, K . L . & Donaldson, B . D . (1975). How to attain optimal productivity. Hospitals, 49 ,77-80.

Sasser, W . E ., Wycoff, D . & Olsen, R . P . (1976). The management of service operations. Boston, Massachusetts: Allyn and Bacon.

Sayles, L . R . (1964). Managerial behavior: Administration in complex organizations. New York: McGraw Hill.

Schnaars, S . P. (1989). Megamistakes: Forecasting and the myth of rapid technological change. New York: The Free Press.

Schulz, R . & Johnson, A . C . (1983). Management of Hospital 2nd edition. New York: McGraw Hill.

Schuster, K . (1980). Survival of the fittest in hospital foodservice1980-89. Food Management, 15(10), 57-120.

Schuster, K . (1982).The statistics of healthcare foodservice 1982-83: Options and obstacles in the world of business, Food Management, March, 40-114.

Shostack, G . L . (1984). Designing services that deliver. Harvard Business Review, 84 (1), 133-139.

Simon, H . A . (1965). The shape of automation. New York: Harper & Row.

Slattery, P. & Olsen, M. (1984). Dynamics of the environment of the hospitality manager. International Journal of Hospitality Management. 3(2).

Snow, C.C. (1976). The role of managerial perceptions organizational adaptation: An exploratory study. Academy of Management Proceedings.

Soelberg, P . O . (1967). Unprogrammed decision making. Industrial Management Review,19-29.

Spears, M. C. (1976). Concepts of cost effectiveness: Accountability for nutrition, productivity. Journal of the American Dietetic Association. 68(4), 311-344.

Stilwell, R . L . (1987). Raising your equipment IQ: Cook-chill systems. Restaurant Business, (1/1).

Sullivan, C . (1990). Management of medical foodservices. New York: Van Nostrand Reinhold.

Tarras, J.M. (1991). A practical guide to hospitality finance. New York: Van Nostrand Reinhold.

Taylor, R . N . & Benbasat, I. (1980). A critique of cognitive style theory and research. Proceedings of the First International Conference on Systems. Ann Arbor Michigan

Terrell, M . E ., Lusby, R . M . , Walker, R . & Northrop, M . W. (1933). A comparative study of amounts and cost of food and labor. Journal of the American Dietetic Association, 9(1), 382-388.

Tersine, R.J. & Riggs, W.E. (1976). The Delphi technique: A long range planning tool. Business Horizons, 19(2), 51-55.

Tichy, N . M . & Ulrich, D . O . (1984). The leadership challenge- a call for the transformational leader. Sloan Managment Review, Fall, 59-68.

Tse, E. (1989). Defining corporate strengths and weaknesses: Is it essential for successful strategy implementation. Hospitality Education and Research Journal,

Tuthill, B.H. & Donaldson, B. (1956). Labor in the dietary department. A study of 10 hospitals. Journal of the American Dietetic Association, 32(6), 541-545.

Unklesbay, N., Maxcy, R. B. , Knickerhm, M., Stevenson, K., Cremer, M. and Matthews, M. E. (1977b). Food service systems: Product flow and microbial quality and safety of foods. NC-120 Reg. Rep. No. 245, University of Missouri-Columbia.

Vroom, V . H . & Jago, A . G . (1974). Decision making as a social process: Norma tive and descriptive models of leader behaviour. Decision Sciences, 5(1), 743-769.

Vulcan Hart (1991, April). Cook-chill made easy. Seminar presented for cook-chill users, Atlanta, Georgia.

Weaver, W . T . (1971). The Delphi forecasting method. Phi Delta Kappan, 52(5), 267-271.

Wechsler, A. (1990). Interest in cook-chill is strong but sous vide still a mystery. Foodservice Trendspotter, 1(3), 1-11.

Witte, E . (1972). Field research on complex decision making processes the phase theorem. International Studies of Management and Organization, 156-182.

Witte, E . & Zimermann, H . (1986). Empirical research on organization decision-making. London, England: Elsevier Science Publishers.

BIBLIOGRAPHY
(not cited)

American Hospital Association. (1976). Shared Food Services in Health Care Institutions. Chicago, Illinois: American Hospital Association.

Barnett, L. (1987). Simplifying operations: Using cook-chill. School Foodservice Journal, 41(3), 78-79.

Bobeng, B.J. & Donaldson, B.D. (1978). HACCP models for quality control of entree production in hospital foodservice systems. Journal of the American Dietetic Association, 73(5), 524-529.

Bower, J.L. (1970). Managing the resource allocation process. Cambridge, Mass. Harvard Graduate School of Business Administrations Division of Research.

Broten, P.R. (1974). Progress in ready foods. Cornell Hotel Restaurant Administration Quarterly, 15, 37-40.

Bryan, L. & Fritz, M. (1976). Increasing employee production and patient satisfaction. Hospitals, 50(19), 125-28.

Buchanan, R.D. (1974a). Two market studies reveal convenience food attitudes and usage, Part I. Food Service Marketing, April, 51-59.

Bunch, W.L., Matthews, M.E., & Marth, E.H. (1976). Hospital chill foodservice systems: acceptability and microbiological characteristics of beef-soy loaves when processed according to system procedures. Journal of Food Science, 41, 1273-1276.

Byrd, R.C. & Morrow, J.T. (1971). Convenience versus conventional operation. Hospitals, 45(6), 90-94.

Carroll, G.H. (1980). Labor time comparison of a cook-freeze and cook-serve system of food production. Journal of Canadian Dietetic Association, 40(1), 39-49.

Carroll, G.H. (1981). Case histories: a bulk pack chilled/frozen production system for a 500 bed hospital. Journal of Foodservice Systems, 1, 51-67.

Clauser, J.K. & Weir, S.M. (1976). Intelligence research methodology. State College, Pennsylvania: American Hospital Association.

Coddington, D . C . , Palmquist, L . E . & Trollinger, W . V . (1985). Strategies for survival in the hospital industry. Harvard Business Review. 85(3), 129-138.

Cremer, M . L . & Chipley, J . R . (1977). Satellite food-service systems assessment in term of time and temperature conditions and microbiological and sensory quality of spaghetti and chili. Journal of Food Science, 42, 225-229.

Cyert, R . M . (1983). The american economy 1960-2000. New York: The Free Press.

Dahl, C . A . & Matthews, M . E . (1979). Hospital cook-chill foodservice systems. Journal of the American Dietetic Association, 75(), 34-37.

Donaldson, B . (1957). Labor hours in the dietary department. Journal of the American Dietetic Association, 33(12), 1239-1243.

Dorney, D . C . , Miller, J . , & Glew, G . (1974). Packaging, storage and transport. Hospitals, 48(14), 81-83.

Eastaugh, S . R . (1987). Financing health care: Economic efficiency and equity. Dover, Delaware: Auburn House Publishing Company.

Ellis, C . (1976). Old, new meld in ready foods systems. Modern Healthcare, July, 41-43.

Farevaag, L . & Matthews, M . E . (1973). Evaluating ready-service food products. Hospitals, 47(20), 108-111.

Feldstein, M. S. (1971). The rising cost of hospital care. Washington, D . C .: Information Resource Press.

Glew, G . & Armstrong, J . F . (1981). Cost optimization through cook-freeze systems. Journal of Foodservice Systems, 1, 235-254.

Hallings, J . F . & Frakes, E . M . (1981). Product-oriented production in a cook-freeze system. Journal of Foodservice Systems, 4(198), 355-361.

Hambrick, D. C. (1982). Environmental scanning and organization strategy. Strategic Management Journal, 3, 159-174.

Hancock, D . A . (1973). Planning the change to convenience foods for a hospital. Journal of American Dietetic Association, 63, 418-423.

Hodder, J. E. & Riggs, H. E. (1985). Pitfalls in evaluating risk projects. Harvard Business Review, January/February, 128-135.

Hysen, P. (1986). The commissary -25000 meals per day. Proceedings of the 42nd Conference of The Society for the Advancement of Foodservice Research.

Jansen, G. R., Harper, J. M., Shigetomi, C. T., & Fallis, L. K. (1972). Pilot study to evaluate food delivery systems used in school lunch programs II. Nutritional value. School Foodservice Research Review, 1(1), 24-29.

King, P. (1988a). New form of flexibility. Food Management, 25(2), 58-62.

King, P. (1988b). A system with room to grow. Food Management, 26(3), 61-64.

King, P. (1988c). A phased approach. Food Management, 23(6), 54-57.

King, P. (1988d). Changing with the times. Food Management, 23(18), 55-57.

Livingston, G. E. (1972). Preprepared food: make or buy? Hospitals, 46 (18), 95-98.

Lough, J. B., Harper, J. M., Jansen, G. R., Shigetomi, C. T. & Anderson, J. (1978). Pilot study to evaluate food delivery systems used in school lunch programs IV. Meal costs. School Foodservice Research Review, 2(1), 23-26.

Lough, J. B., Harper, J. M., Jansen, G. R., Shigetomi, C. T. & Anderson, J. (1978). Pilot study to evaluate food delivery systems used in school lunch programs III. Physical facilities. School Foodservice Research Review, 2(1),18-21.

McLaren, A. (1980). Containing the costs of food service. Hospitals, 54(6), 75-77.

McProud, L. M. (1983). Reducing energy loss in food service operations. Food Technology, 36(7), 67-69.

Manly, B .F .J. (1986). Multivariate statistical method: A primer. New York: Chapman Hall.

Matthews, M. E. (1977). Quality of food in cook-chill foodservice systems: a review. School Foodservice Research Review, 1(1), 15-19.

Mayer, J . (1978). Introduction . In P . H . Hill et al. (Eds.), Making decisions: A multidisciplinary introduction. Reading, Massachusetts: Addison-Wesley Publishing Company.

May, E. N. (1955). Economics of hospital food service. Modern Hospitals, 85, 80.

Meyer (1986). A productivity analysis of the dietitian as a health care team member in the service sector. Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Miles, R. E. & Snow, C. C. (1978). Organizational strategy, structure, and process. New York: McGraw Hill.

Mill, R. C. (1989). Productivity in service organizations. In P.Jones (Ed.), Management in service industries. London: Pitman Publishing.

Miller, D. (1988). Relating Porter's business strategy to environment and structure: Analysis and performance implications. Academy of Management Journal, 31(2), 280-308.

Millross, J., Hill, M . A. , & Glew, G (1974). Consequences of a switch to cook-freeze. Hospitals, 48 (18), 118-126.

Millross J . & Glew, G . (1974). Staff, equipment and wastage. Hospitals, 4 (16), 72-75.

Murray, I . P . & Upton, E . M . (1988). Labour productivity in hospital foodservice. Journal of the Canadian Dietetic Association, 49(3), 179-181.

Olsen, M . D . (1975). Labor cost information. Journal of the American Dietetic Association, 67(), 55-59.

SPSSX User's Manual. 3rd edition. Chicago, Illinois: SPSS Inc.

Sullivan, C . (1990). Management of medical foodservices. New York: Van Nostrand Reinhold.

Thomas, C . (1987). Use and cost of electricity for selected processes specific to a hospital cook-chill/ freeze food-production system. Journal of Foodservice Systems, 4, 159-169.

Tichy, N . M . & Ulrich, D . O . (1984). The leadership challenge- a call for the transformational leader. Sloan Managment Review, Fall, 59-68.

Upton, E . M . & Glencross, P . D . (1981). Convenience food use in eight hospital in Ontario. Journal of the Canadian Dietetic Association, 1 (1), 39-46.

Unklesbay, N . (1977a). Monitoring for quality control in alternative foodservice systems. Journal of the American Dietetic Association, 71(4), 423.

Wilkinson, P . J . (1988). Food hygiene in hospitals. Journal of Hospital Infection, 1 (1),77-81.

Williamson, B . J . (1975). Tomorrow's system - the food factor - today. Journal of the American Dietetic Association, 66(5), 499-504.

Yung, L. S., Matthews, M. E., Johnson, V . K . , & Johnson, N . E . (1981). Variables affecting productivity in food service systems of nursing homes. Journal of the American Dietetic Association, 78 (4), 342-348.

Zikmund, W . G . (1991). Business research methods. Chicago, Illinois: Dryden Press.

Zolber, K . (1971). Research on assembly-serve system. Hospitals, 45 (2), 83-88.

BLANK PAGE
NO TEXT MISSING

APPENDIX A

Definitions

Administrative decision process- those activities involved in the selection of a group of people to make decisions, gathering of information through the use of various resources, and visits to other cook-chill sites

Decision theory- methods for solving problems through assessing alternatives when uncertainty plays a critical role

Diagnostic related groups (DRG)- a reimbursement plan for healthcare costs. This plan was developed by Congress to control costs by setting fixed fees for the treatment of specific diseases and disorders.

Heuristic -a trial-and-error tactic used by a decision makers to speed the process of learning or finding out

Model- an abstraction of reality or simplified representation of some real world phenomena

Organization- a structure consisting of two or more persons who accept coordinated direction to achieve certain goals

Parameters- comprised of those comprehensible and measurable factors that can be expressed in quantitative terms such as labor costs, food costs, equipment costs, labor force, demand, waste assessments of quality, consistency, customer satisfaction

Performance evaluation- the difference between expected performance measures and actual performance measures to form an opinion regarding the decision to select cook-chill.

Performance measures- based on parameters and include quantifiable measures based on a priori predictions.

Programmed decision- repetitive, routine for solving a problem

Rationality- a way of thinking about a decision that stresses political, logical, and ethical means of drawing an inference to make a judgment

Satisficing- a decision rule calling for the first alternative that meet present norms to be adopted

Selection decision - the incorporation of parameters, variables, utility function, and performance measures to make the decision to select or not select cook-chill.

System- a bounded region in space and time with component parts that interact with each other causing stress and strains, input and outputs, and feedback. Systems are a functional relationship with their environment.

Unprogrammed decision- novel , unstructured problem to which no routine solution is available

Variables - available alternatives such as 1) the choice of cook-chill over cook-freeze , conventional, or convenience production processes, 2) the choice to have or not have a test kitchen, 3) the percentage of foods that would be prepared by cook-chill

Utility function (Keeney and Raiffa, 1976)- often also called a preference function, is a subjective assessment of the well being of a person based on his decision at any given point in time. Weights or values, often based on a person's perceptual framework will differ among individuals. Value does not signify a financial concept, but rather a subjective concept.

APPENDIX B

PHASE 1 DELPHI TECHNIQUE

Delphi Panel for Developing Model of Decision Process
of Selection Cook-chill

Phil Bomershein
Commonwealth of Virginia
Department of Mental Health and
Mental Retardation
P.O. Box 1797
Richmond, Virginia 23214

Margaret Burris, R.D.
The Methodist Hospital
Food Service Department
6565 Fannin Street
Houston, Texas 77030 2707

Gayle Dixon, R.D.
Director, Foodservice Operations
Presbyterian Hospital
200 Hawthorne Lane
P..O. Box 33549
Charlotte, North Carolina 28233

Harriette Duncan, Ph.D., R.D.
Winthrop College
Rock Hill, South Carolina

J. Haldeman
Assistant Foodservice Director
Community Hospital
1500 N. Ritter Avenue
Indianapolis, Indiana 46219

Steve Hopkins
Baptist Hospital
Winston-Salem, North Carolina

Jay Nichols
Crimsco
5001 East 59th Street
Kansas City, Missouri 64130

Jim Parsons
Dewberry and Davis
8401 Arlington Blvd.
Fairfax, Va 22031

Mary Rogers
Cherry Hospital
Food Service Department
Caller Box 8000
Highway 581 West Goldsboro
Goldsboro, North Carolina 27530

Connie Rotchford, R.D.
Rochester Methodist Hospital
Food Service Department
201 West Center Street
Rochester, Minnesota 55902

Carol Sawyer,Ph.D.
Michigan State University
Department of Food Science and Human Nutrition
334 Food Science Bldg.
East Lansing, Michigan

Glen Schrig
Director of Nutrition Services
Vanderbilt University Medical Center
B-802
1301 22nd Avenue South
Nashville, Tennessee 37232 5510

Beverly Soshea
3M Center
FSS
Bldg 225 5S 01
St. Paul, Minnesota 55144

Delphi Panel (continued)l

Barbara Millenbruch, R.D.
3400 N.E. 12th Avenue, Suite 169
Ft. Lauderdale, Florida 33334

Romain Baharloo
Morton Plant Hospital
323 Jeffords Street
Clearwater, Florida 33516

Andrea Sutherland
Department of Mental Health and Mental Retardation
P.O. Box 1797
Richmond, Virginia 23214

Phase 1 Questionnaire (Part A)
Decision Factors in the Selection of Cook-chill Production for Hospital Foodservices

The purpose of this questionnaire is to get your opinion on the factors you consider to be critical in the decision to select cook-chill food production for hospital foodservices. To give structure to your responses, you have been provided a framework of six functional areas plus an area for your comments that may not fit into the designated framework.

Functional area	*Factors considered in the decision process*
Human resources	
Finance	
Marketing	
Administration	

Research and Development
Operations
Your Comments

Phase 1 Questionnaire (Part B)
Characteristics of a Successful Cook-chill Production for Hospital Foodservices

The purpose of this questionnaire is to get your opinion on the characteristics of a successful cook-chill food production for hospital foodservices. To give structure to your responses, you have been provided a framework of six functional areas plus an area for your comments that may not fit into the designated framework.

Functional area	*Factors considered in the decision process*
Human resources	
Finance	
Marketing	
Administration	

Research and Development
Operations
Your Comments

Functional Area Terminology

A functional area is a subunit of an organization that translates the overall strategy of the organization into action. Listed below are definitions of the six functional areas of any organization.

Often times decisions in organizations are based on the needs of one functional area (subunit) without consideration to the impact on the rest of the organization. With this in mind, the six functional areas concept was selected for evaluating the impact of cook-chill on a hospital foodservice operation.

Human resources

The importance of human resources in an organization has become more accepted in recent years. In this subunit of an organization the effective utilization of human resources including **employee recruitment, selection, orientation, training, career development, compensation, labor relations, discipline, control, and evaluation** would be the primary considerations.

Financial/Accounting

In most organizations, the financial/accounting subunit plays an integral part. Financial/accounting concerns may be based on long term strategies which will guide **capital acquisition** and **capital allocation**. Growth strategies in organizations usually require numerous investments in facilities, projects, acquisitions, and people. Capitol allocation is determined by the level of capital expenditure delegated to operating managers. Short terms strategies are those which are critical to the daily operation such as **working capital management.**

Marketing

Marketing is the subunit concerned with profitability bringing about the sale of a product/service. In this subunit, the concern would be the **what product/service, what price, which place,** and **what promotion** to use to meet the overall goals of the foodservice operation.

Administration

Administration plays a critical role in the success of any organization. **Commitment and support of** administration in a project can be the critical ingredient for success or failure. Administration makes the decisions as to the allocation of resources and the choice of strategies to follow.

Research and Development

With the increasing rate of technological change in most industries today, the need for research and development has become more acute. The criteria for consideration in this subunit is the need for R&D, the type of R&D to be done, the procedure by which R&D will be done, and the relationship of R&D to the other subunits such as human resources, marketing, operations, administration, and finance.

Operations

The core function of operations is the converting of input such as raw materials, supplies, people, and equipment into outputs. This subunit usually gets more attention than others in decision to select and the evaluation of the success of cook-chill installations. The primary criteria in this functional area are a **balance between investment in the inputs and the value of the outputs.** To accomplish this goal, attention would be given to **facilities and equipment, purchasing, and operations planning and control.**

COLLEGE OF HUMAN RESOURCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061-0429

DEPARTMENT OF HOTEL, RESTAURANT & INSTITUTIONAL MANAGEMENT
(703) 231-5515 · Fascimile (703) 231-7826 · Telex 9103331861

September 30, 1991

Phil Bomershein
DMHMR SAS
P.O. Box 1797
Richmond, Virginia 23214

Dear Mr. Bomershein:

As hospital foodservice administrators look for solutions to the problems of a dwindling supply of labor, spiraling food and labor costs, food safety, and product consistency, the cook-chill production process becomes a viable alternative. Research on the cook-chill process that would aid the administrator in making a systematic decision is limited in scope and scarce in quantity.

We are conducting this study to develop a systematic decision making model for the selection of cook-chill production processes. You have been asked to participate in the development of the model by giving your expert opinion on decision factors and success characteristics.

The process that will be used to collect the information is called the Delphi method. This method has been used with success in situations where there are differences of opinion on specific topics. For the purposes of this study, the Delphi method will involve two phases. For the first phase, you will be asked to completed the enclosed questionnaire by

1) listing factors that should be considered in the decision to select cook-chill for a hospital foodservice and
2) listing the characteristics of a successful cook-chill production in a hospital setting.

In the second phase, you will receive a questionnaire that will be a composite of the comments of the Delphi panel. You will then be asked to rank the factors and characteristics with regard to the importance of each.

The responses to the second phase will be statistically analyzed and a decision model will be developed based on the decision factors. This model will be tested at several hospitals. Once that the model is tested, the success of the hospital foodservice cook-chill process will be evaluated based on your rankings of success factors.

In response to the pressures to improve the efficiency of hospital foodservices, many foodservice administrators may consider cook-chill. The purpose of this study is to give foodservice administrators some guidelines on making the decision to select cook-chill. Your participation in this process will be greatly appreciated and will insure that the model developed more adequately meet the needs of today's foodservice administrators.

If you have any questions regarding the process, please feel free to contact me at 919 282 6530 or 919 334 5313. I look forward to working with you.

Cordially,

Claudia Green

Claudia G. Green, M.S.,R.D.
Doctoral Candidate
Virginia Polytechnic Institute and State University

PHASE 2 DELPHI TECHNIQUE

PHASE 2 DELPHI TECHNIQUE

COLLEGE OF HUMAN RESOURCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061-0429

DEPARTMENT OF HOTEL, RESTAURANT & INSTITUTIONAL MANAGEMENT
(703) 231-5515 - Fascimile (703) 231-7826 - Telex 9103331861

Dear Delphi Panel Member:

Thank you for your participation in this expert panel on cook-chill food production processes. Upon receiving your Phase 1 responses, I grouped and reduced the number of comments to develop the Phase 2 Delphi instruments. Enclosed you will find the two instuments which will ask that you assign a numerical value(using the scales provided)to the level of importance of each decision factor and the desirability of specific characteristics of a successful cook-chill operation.

To encourage a speedy return of these instruments, I am offering an opportunity to win a $100 Marriott Hotel Gift Certificate. The first 15 people to return both instruments completed will be eligible to participate in the drawing. Not only will you have a 1/15 chance at the certificate, but you will also have the good feeling that you have helped a doctoral student along the path to completing her dissertation!

I sincerely appreciate your help. Please take a few minutes to complete and return the forms today. The drawing will be January 17, 1992.

Cordially,

Claudia G. Green, M.S.,R.D.
Doctoral Candidate
Virginia Tech

Directions for Survey 1

Ranking Decision Factors

On the attached pages you will find a list of factors to be considered in decision to select cook-chill production for a hospital foodservice. These factors were derived from the results of a survey of cook-chill operators. Using the scale described below, please rank each factor with regard to its importance in making the decision to select cook-chill production. Indicate your answer by making one response based on your expert opinion in the blank preceeding each statement.

Scale

1. very important
   - a most relevant point
   - first order of priority
   - has direct bearing on major issues
   - must be resolved, dealt with or treated

2. important
   - is relevant to the issue
   - second order of priority
   - significant impact but not until other items are treated
   - does not have to be fully resolved

3. moderately important
   - may be relevant to the issue
   - third order of priority
   - may have impact
   - may be determining factor to major issue

4. unimportant
   - insignificantly relevant
   - low priority
   - has little impact
   - not a determining factor to major issue

5. most unimportant
   - no priority
   - no relevance
   - no measurable effect
   - should be dropped as an item to be considered

Survey 1

Ranking the Importance of Factors in Making the Decision to Select a Cook-chill Production Process

Scale

1. very important 2. important 3. moderately important 4. unimportant 5. most unimportant

_____ To examine current labor cost and project anticipated savings in labor cost.

_____ To assess current labor supply

_____ To determine the levels of staffing required for operating a cook-chill process (administration, diet, stock personnel, and numbers required)

_____ To plan schedule with fewer production shifts

_____ To explore possibility of hiring skilled staff with experience in cook-chill

_____ To provide specialized training in sanitation and specifics of cook-chill for staff

_____ To calculate the anticipated return on investment

_____ To determine the method of financing

_____ To figure the cost of installing cook-chill in new operation versus remodeling in existing facility

_____ To explore the revenue generating potential by providing cook-chill products to other foodservice operations

_____ To project the potential reduction in food cost through improved production control

_____ To calculate the complete cost of using cook-chill including renovation (if needed), installation, start up, ongoing maintenance, and supplies.

_____ To get an idea of the attitudes of governing agency, medical staff, etc regarding cook-chill

_____ To understand the nature of the hospital foodservice market (patients, employees, visitors, and the community)

_____ To identify positive experiences with cook-chill production in nearby geographic locations

_____ To address the image of and marketability of foods prepared in advance to your customer base

_____ To give attention to the notion that cook-chill produces foods that may be called "planned" leftovers

_____ To determine if the the objectives of chosing cook-chill are to meet all food production needs or to support a conventional production process

_____ To decide if cook-chill process becomes part of the hospital nutrition foodservice or does it have a separate corporate structure

_____ To determine the commitment of administration to provide adequate management, testing, and quality assurance capability with cook-chill

_____ To determine the willingness of administration to subscribe to changes required to make cook-chill a success

_____ To assess the willingness of administration to to commit to labor reduction to amortize project costs

_____ To evaluate the administrative awareness of Quality Assurance and Quality Control require ment for cook-chill

_____ To consider the level of understanding of administration with regard to food safety issues of cook-chill and the need for adequate quality control personnel

_____ To determine if the shelf life of cook-chill foods is support by lab data

_____ To plan the necessary sanitation procedures

_____ To make a comparison of available equipment to cook-chill

_____ To simulate the cook-chill process before installation

_____ To conduct a microbial evaluation as well as aesthetic assessment of food products

_____ To plan site visits to other cook-chill operations

_____ To assure that travel funds are available for site visits

_____ To test recipes and make adjustments for cafeteria and tray line service and reheating procedures

_____ To evaluate which food products are made in enough volume to justify the cost of using cook chill

_____ To have an ongoing test kitchen doing R &D for cook-chill food items

_____ To plan for menu and/or recipe modifications during to extended storage time and holding temperature.

_____ To consider if cook-chill equipment can be used to fullest capacity

_____ To consider hidden costs (bags, cleaning time, training)

_____ To plan the procedure for reheating finished products

_____ To consider the need for provide adequate refrigeration to hold products

_____ To determine the willingness to change to cook-chill production

_____ To plan for the organizational change that will occur with the introduction of cook-chill production

Directions for Survey 2

Ranking Success Characteristics

On the attached pages you will find a list of characteristics considered to be typical of a successful cook-chill operation. These success characteristics were derived from the results of the Phase 1 Delphi. Using the scale described below, please rank each characteristic with regard to its desirability in a "successful" cook-chill operation. Indicate your answer by marking one number (1-5) based on your expert opinion in the blank preceeding each statement.

Scale

1. highly desirable

will have a positive effect and little or no negative effect
operational benefits will far outweight operational costs
justifiable on its own merit
valued in and of itself

2.desirable

will have a positive effect with minimum of negative effects
operational benefits greater than operational costs
justifiable in conjunction with other items
little value in and of itself

3.neither desirable nor undesirable

will have equal positive and negative effects
operational benefits equal operational costs
may be justified in conjunction with other desirable or highly undesirable items
no value in and of itself

4.undesirable

will have a negative effect with little or not positive effect
operational costs greater than operational benefits
may be only justified in conunction with a highly desirable item

5.highly undesirable

will have major negative effect
social costs far outweigh any social benefit
not justifiable
extremely harmful in and of itself

Survey 2

Ranking the Desirability of Characteristics in a Successful Cook-chill Operation

1. highly desirable 2. desirable 3. neither desirable nor undesirable 4. undesirable 5. highly undesirable

_____Experienced and trained personnnel at all levels

_____Personnel who can comprehend digital scale display, computer recipe printouts, etc, and who demonstrate care in weigh ups, sanitation, temperature control

_____Lower labor costs

_____People successfully manage and use the cook-chill process

_____Consistent food products

_____Quality food products

_____Ongoing testing of new products

_____ An improved schedule for skilled employees that deletes weekends and limits number of shifts necessary

_____Highly trained and skilled staff in time temp management of menu items prepared by cook-chill

_____Handwashing facilities readily accessible

_____Sanitation instructions posted

_____Return on investment that has met financial goals

_____Return on investment that pays back in five years or less

_____Increased revenue through providing products to other foodservice operations

_____Use of equipment to capacity

_____Sound capital investment program based on labor and inventory savings

_____Cook-chill production has the acceptance and support from production staff to reheating staff

_____ All customers are satisfied with the food product

_____ Recognition among hospital administrators and public that cook chill is an asset to hospital both from a qualtiy and cost control point

_____ Facility and process recognized in the community as innovative- one sought out by students and peers

_____ Understanding by staff of general principles and strengths of cook-chill

_____ Demonstrated improvement in food service operations in terms of cost and quality(cost down and quality up)

_____ All customers perceive quality output at lowest possible cost

_____ Well coordinated efforts between production facilties and foodservice use operations

_____ Acceptance of use of cook-chill throughout operations

_____ Consider role of USDA in system

_____ Strong support of all administration in their commitment to change to cook-chill technology

_____ 500 plus meals per meal period to make the cook-chill process pay for itself

_____ Maintain quality assurance procedures and bacteriologic testing

_____ Regular introduction of new products

_____ Product testing with customers (foodservice staff, public customers,and hospital staff)

_____ Ongoing monitoring of satisfaction with food

_____ Maintain communication network with other cook chill operators

_____ Test kitchen available and staffed for use

Quantitative Values Assigned to Importance and Desirability Scales

Consensus score	Importance	Desirability
Less than 1.80	Very important	Highly desirable
Equal to or greater than 1.80 but less than 2.60	Important	Desirable
Equal to or greater than 2.60 but less than 3.40	Moderately important	Neither desirable nor undesirable
Greater than 3.40 but less than or equal to 4.20	Unimportant	Undesirable
Greater than 4.20	Most unimportant	Highly undesirable

Note. From Linstone, H.A. & Turoff, M. (1975). The Delphi Method: Techniques and Applications.

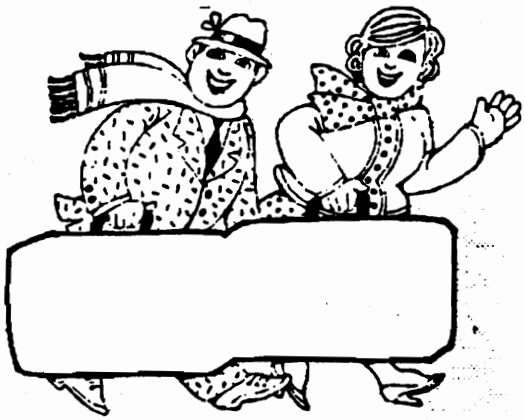
Complete and return the enclosed surveys for your chance to win!!!

$100 Gift Certificate

Good at any Marriott Hotel

Be in the first 15 participants to return the surveys and get a chance for $100!

Anticipated date of drawing January 17.



PHASE 3 DELPHI TECHNIQUE

School of Human Environmental Sciences

THE UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

Department of Food, Nutrition and Food Service Management

322 Stone Building, UNCG
Greensboro, NC 27412-5001
(919) 334-5313

March 12, 1992

Joe Schoenek
Moses Cone Memorial Hospital
1200 North Elm Street
Greensboro, NC 27420

Dear Joe:

The winner of the $100 Marriott Gift Certificate is Glen Schrig of Vanderbilt Medical Center Hospital in Nashville, Tennessee. **Do not despair, however, there is still one more chance to win the second $100 Marriott Gift Certificate and the odds are even better (1 in 12!).**

Enclosed you will find the final Delphi Questionnaire which will conclude this research project. **Please complete the questionnaire and return in the enclosed stamped envelope by Tuesday, March 31.** All responses received by March 31 will be put in the drawing for a second $100 Marriott certificate during the first week of April!!

I sincerely appreciate your participation in this Delphi panel. Your professional opinions and comments have been integral in the development of the decision model for the selection of cook-chill. With your timely cooperation and returned questionnaires, I will be able to complete this research project by the end of May or early June.

I have enclosed a copy of the Delphi panel members. With your permission, I would like to be able to mention your names in any publication I may write on this research topic. I will be participating in a panel discussion on the use of the Delphi research method at the International Meeting of the Council on Hotel, Restaurant, and Institution Education this July.

If you would like to receive a copy of the model and the results of this study, please check the appropriate blank on the questionnaire.

Again, many thanks for your help with this project.

Cordially,

Claudia

Claudia G. Green,R.D., A.D.B. (August, 1992!)
Doctoral Candidate
Virginia Tech

Enclosures

Phase 3 Delphi Panel
Cook-chill Decision Process Questionnaire

1. Are you currently affiliated with a hospital foodservice which uses cook-chill food production technology?

   Yes _____ (go to #2) No _____ (go to #8)

2. How long has the hospital foodservice operation used cook-chill production?

   less than 1 year_____ between 1-2 years _____ between 2-3 years _____
   between 3-4 years _____ between 4-5 years _____ over 5 years _____

3. Approximately what percentage of the menu items served at the hospital is produced by cook-chill technology?

   25% _____ 50% _____ 75% _____ 100% _____

4. Approximately how many **patient meals** are served daily at this hospital? _____

5. Approximately how many **non-patient meals** are served daily at this hospital? _____

6. What portion of all meals served at this hospital are prepared on site? _____

7. What were the labor minutes per meal served (without cook-chill technology)? _____

8. Have you been involved in the decision to select/not select cook-chill food production technology for a hospital foodservice?

   Yes _____ (go to #9) No _____. Please return questionnaire without completing.

9. In how many different evaluations of cook-chill production technology for hospital foodservices have you been involved?

   1 evaluation ____ 2 evaluations _____ 3 evaluations _____

   4 evaluations _____ 5 or more evaluations _____

10. From your experience, was the decision to select/not select cook-chill production technology made by:

an individual _____ (go to #11)

a group _____(go to #12)

11. If the decision to select/not select cook-chill technology was made by an individual, what was the position title of the"decision maker" (at the time the cook-chill decision was made)?

_____

12. If the decision to select/not select cook-chill was made by a group, howmany people were in the group? (Circle one)

1 2 3 4 5 6 7 8 9 10

13. How many people involved in the decision process had a foodservice background?

less than 3 people _____ 4-6 people _____ 7-9 people _____

10+ people _____ I do not know _____

14. In your experience with the process of deciding to select/not select cook-chill, how much time passed between the introduction of the cook-chill concept to the final decision to implement /not implement cook-chill?

6 months or less _____ 7-12 months _____ 13-18 months _____

19-24 months _____ over 25 months _____ I do not know _____

15. How would you rank the level of support from the hospital administrator in the process of making the decision to select cook-chill?

1	2	3	4	5
Very negative attitude toward cook-chill		Indifferent attitude toward cook-chill		Very positive attitude toward cook-chill

In the analysis of the decision to select/not select cook-chill, was consideration given to the hospital foodservice becoming a profit center by marketinging cook-chill prepared foods to: (check all that apply)

16. other hospitals? _____

17. nursing homes? _____

18. elderly feeding programs ?_____

19. schools? _____

20. day care centers ?_____

21. other ? _____(please specify)

In the process of gathering information to make the decision to select or not select cook-chill, which resources were consulted ?

Resources	Yes	No	If yes, how many ?
22. foodservice consultants			
23. foodservice equipment suppliers			
24. manufacturer representatives			
25. other cook-chill users			
26. industry journals*			
27. professional journals**			
28. seminars/conferences			
29. other (please specify)			

* For example Restaurant&Institutions, Restaurant Business, Hospitals, etc.

** For example Food Technology, Journal of the American Dietetic Association, Journal of Foodservice Systems, etc.

In the process of analyzing the decision to select/not select cook-chill, were financial calculations (such as food cost percentage, total dietary expense, net present value, payback period, etc.) made?

30. Yes _____ No_____

If yes, were the calculations made by:

Resource for financial calculations	Yes	No	I do not know
31. an outside consultant?			
32. a sales representative?			
33.a manufacturer representative?			
34. the hospital accounting office?			
35. the hospital foodservice administrator?			
36. other? (please specify)			

As part of the process of gathering information for the cook-chill decision, did the person responsible for the calculations:

Calculations	Yes	No	I do not know
37. calculate the ***hospital foodservice food cost percentage*** before cook-chill?			
38. calculate the ***projected hospital food cost percentage*** after cook-chill?			
39. calculate the ***total dietary expense percent*** before cook-chill?			
40. calculate the ***projected total dietary expense percent*** after cook-chill?			
41. calculate the ***total dietary salary expense*** before cook-chill?			
42. calculate the ***projected total dietary salary expense*** after cook-chill?			

(continued) As part of the process of gathering information for the cook-chill decision, did the person responsible for the calculations:

Calculations	Yes	No	I do not know
43.calculate the ***foodservice labor cost percentage*** before cook-chill?			
44. calculate the ***projected foodservice labor cost percentage*** after cook-chill?			
45. calculate ***total meals served per labor hour*** before cook-chill?			
46. calculate ***projected total meals served per labor hour*** after cook-chill?			
47. calculate the ***break-even point*** (where sales and expenses are equal with zero profit) for the hospital foodservice with cook-chill?			
48. calculate the ***net present value*** of the dollar investment in installation of cook-chill?			
49. calculate the ***return on investment*** (ROI) in cook-chill?			
50. calculate a ***payback period*** for the investment in cook-chill?			

When financial calculations were made available to the "decision maker(s)," did they:

Use of financial calculations	Yes	No	I do not kow
51. use the ***hospital food cost percentage*** as a reason for deciding to select/not select cook-chill?			
52. use the ***total dietary expense*** as a reason for decidingto select/not select cook-chill?			
53. use ***total dietary salary expense*** per meal as a reason for deciding to select/ not select cook-chill?			

(continued) When financial calculations were made available to the "decision maker(s)," did they:

Use of financial calculations	Yes	No	I do not kow
54. use the ***foodservice labor cost percentage*** as a reason for deciding to selec/not select cook-chill?			
55. use the ***total meals served per labor hour*** as a reason for deciding to select/not select cook-chill?			
56. use the ***break-even point*** as a reason for deciding to select/not select cook-chill?			
57. use the ***net present value*** of the investment in cook-chill as a reason for deciding to select/ no to select cook chill?			
58. use the ***return on the investment*** in cook-chill as a reason for deciding to select/not select cook-chill?			
59. use the ***projected payback period*** as a reason for deciding to select/not select cook-chill?			

In the analysis that led to the decision to select/not select, did the decision maker(s):

	Yes	No	I do not know
60. ***assess the quality of food*** served before cook-chill?			
61. ***predict the quality of food*** served after cook-chill?			
62. ***use quality assessments*** before and/or after cook-chill as reasons for deciding to select/not select cook-chill?			
63. ***assess the consistency of food*** served before cook-chill?			
64. ***predict the consistency of food*** served after cook-chill?			

In the analysis that led to the decision to select/not select, did the decision maker(s):

	Yes	No	I do not know
65. use *consistency assessments* before and/or after cook-chill as reasons for deciding to select /not select cook-chill?			
66. *evaluate customer satisfaction* with foods served before cook-chill?			
67. *predict customer satisfaction* with foods served after cook-chill?			
68. *use customer satisfaction evaluations* before and/ or after cook-chill as reasons for deciding to select cook-chill?			
69. *record amount of food wastage* before cook-chill?			
70. *predict the amount of food wastage* after cook-chill?			
71. *use food wastage* before and/or after cook-chill as reasons for deciding to select/not select cook-chill?			
72. *monitor food holding temperatures* before cook-chill?			
73. *predict food holding temperatures* after cook-chill?			
74. *use food holding temperatures* before and/or after cook-chill as reasons for deciding to select/not select cook-chill?			
75. *monitor food storage time* before cook-chill?			
76. *predict food storage time* after cook-chill?			
77. *use food storage times* before and/or after cook-chill as reasons for deciding to select/not select cook-chill?			

During the process of making the decision to select/not select cook-chill,

	Yes	No	I do not know
Was the cost of cook-chill calculated to include: 78. cost of equipment?			
79. cost of installation?			
80. cost of facility renovation?			
81. cost of employee training?			
82. cost of installing and updating floor pantries?			
83. cost of installing or updating test kitchen?			
84. cost of rethermalization (reheating) equipment?			
85.cost of delivery equipment?			
86. Was the shortage of skilled food production labor in the geographic region considered?			
87. Was the abundance of food production labor in the geographic region considered?			
88. Was money budgeted to cover the cost of staffing a test kitchen?			
89. Were plans made for a reduction in number of foodservice employees on staff?			

Prior to considering cook-chill in the hospital foodservice operations.

	Yes	No	I do not know
90. Was the standard ***number of patients per food service employee calculated? (FTE)***			
91. Was the ***number of minutes of labor required to serve one meal*** to one person calculated?			
Was attention given to ***food safety*** through regular 92. ***sanitation training*** for foodservice employees?			
93. monitoring of ***food production techniques***?			
94. monitoring of ***food storage times***?			
95. monitoring of ***food storage temperatures***?			
96. monitoring of *food holding times*?			
97. monitoring of *food holding temperatures*?			
98. monitoring of ***food temperature at time of service?***			
99. examining ***bacteria content*** of food samples?			
100. Was monthly ***food cost percentage*** calculated based on monthly inventory figures?			
101. Was food waste due to ***over production*** and theft recorded?			
102. Were ***customer satisfactionsurveys*** given at regular intervals?			
103. Were ***patient satisfaction surveys*** given at regular intervals?			
104. Was ***customer feedback*** gathered through suggestion boxes?			
105. Were ***food acceptance records*** maintained to determine the amount of food consumed by the patients?			

Prior to considering cook-chill in the hospital foodservice operations,

	Yes	No	I do not know
106. Were standard recipes for all menu items available in the production areas?			
107. Were standard recipes routinely followed?			
108. Were standard food portioning tools available at each point of service?			
109. Were standard food portions served at each point of service?			

In the process of making the decision to select/not select cook-chill, was consideration given to :

	Yes	No	I do not know
110. convenience (prepared) foods an alternative?			
111. cook-freeze food production as an alternative?			
112. blast chill versus tumble chill as a procedure for quick chilling foods?			
113. the percentage of menu items which could be prepared by cook-chill?			
114. the capacity of cook-chill equipment needed based on the existing food production demand?			
115. the capacity of cook-chill equipment needed based on the projected food production demand?			
116. the need for a food product test kitchen with cook-chill?			
117. the need for recipe testing prior to implementing cook-chill?			
118. the need to develop new recipes for cook-chill?			

In the process of making the decision to select/not select cook-chill, was consideration given to :

	Yes	No	I do not know
119. the need to adapt and test existing recipes for cook-chill?			
120. the need to establish that dietary staff would be responsible for rethermalizing (reheating) food and for tray delivery?			
121. the need to establish that nursing staff would be responsible for rethermalizing (reheating) food and for tray delivery?			

122. Did the decision maker(s) visit other cook-chill production facilities during the decision process?

Yes _____ No _____

123. Did the visit(s) have an impact on their decision?

Yes _____ No _____

124 . Have the decision maker(s) been satisfied with the decision to select cook-chill technology?

Yes _____ No _____

125. Would like to receive a copy of the results of this study?

Yes _____ No _____

If the decision maker(s) made the decision to select cook-chill, are they satisfied with:

	Yes	No	I do not know
126. the extent to which production employees have applied their training in cook-chill production ?			
127. the extent to which service employees have applied their training in reheating chilled foods?			
the level of acceptance of the cook-chill system: 128. by the patient?			
129. by the non-patient customer?			
130. by the foodservice staff?			
131. by the nursing staff?			
132. by the administrative staff?			
133. by the medical staff?			
the level of acceptance of quality of foods prepared with the cook-chill system: 134. by the patient?			
135. by the non-patient customer?			
136. by the foodservice staff?			
137.by the nursing staff?			
138. by the administrative staff?			
139. by the medical staff?			
140. the ability to reduce food wastage through eliminating over production?			
141. the ability to reduce food spoilage through adhering to controlled production techniques?			
142. the ability to reduce food spoilage through adhering to controlled food storage times ?			

If the decision maker(s) made the decision to select cook-chill, are they satisfied with:

	Yes	No	I do not know
143. the ability to reduce food spoilage through adhering to controlled food storage temperatures?			
144. the ability to reduce food spoilage through adhering to controlled food holding times?			
145. the ability to reduce food spoilage through adhering to controlled food holding temperatures?			
146. the ability to reduce food spoilage through examining bacteria content of food samples?			
147. the ***food cost percentage*** after introduction and implementation of cook-chill?			
148. the ***total dietary salary expense per meal*** after the introduction and implementation of cook-chill?			
149. the ***foodservice labor cost percentage*** after the introduction and implementation of cook-chill?			
150. the ***total meals served per labor hour*** after the introduction and implementation of cook-chill?			
151. the use of ***break-even point*** as a reason for deciding to select/not select cook-chill?			
152. the use of ***net present value*** as a reason for deciding to select/not select cook-chill?			
153. the use of ***return on investment*** in cook-chill as a reason for deciding to select/not select cook-chill?			
154. the use of projected payback period as a reason for deciding to select/not select cook-chill?			
155. ***total actual investment*** in cook-chill?			

156. If cook-chill production technology was selected, what was the ONE most important factor contributing to the decision TO SELECT?

157. If cook-chill production technology was not selected, what was the ONE most important factor contributing to the decision TO NOT SELECT?

APPENDIX C

Crimsco Inc.

February 18, 1992

Claudia G. Green, M.S., R.D. (A.B.D.)
Virginia Tech, HRIM Dept.
Hillcrest
Center for Hospitality Research & Service
P. O. Box 850
Blacksburg, VA 24061

Dear Claudia:

You left out one of the most important questions on Survey 1. It's a question that I find is seldom asked and it leads to a whole series of other questions because most cook/chill systems are rejected on the basis of their expense to the hospital versus the uncertainty of the savings. The question is, what is the cost per bed of the total cook/chill system?

This question can be broken down to, what is the cost per bed per production equipment and what is the cost per bed of the retherm system? This leads to another question which is, are floor pantries available currently or do they have to be built? If you have to build floor pantries for a cook/chill system, then you have to ask, what is the cost per bed of the floor pantries because it is an incremental cost.

Another key question that you left out which comes to mind is, does nursing service or dietary pass the trays? This is a killer. If administration won't approve funding for dietary to pass the trays, then chances of a cook/chill system being a success, in my opinion, is reduced by a full 50%.

A key question on your success ranking is, who estimates the lower labor costs? I have some unscrupulous competitors who make very optimistic estimates of lower labor costs that are done on a fancy computer program which gullible food service directors accept at face value, then when the system is installed, they are only able to achieve a fraction of the projected savings.

It is also critical to earmark which of the savings is due to the installation of the cook/chill system and which of the savings is the result of a change in management philosophy or emphasis.

I am including a study I did for a hospital in Detroit that shows you how complicated this process is and how unreliable the estimates of many manufacturers are as to labor savings.

5001 East 59th Street, Kansas City, Missouri 64130
Telephone: Code 816-333-2100
WATS: 800-821-3912

If it is possible for the food service director to get his department set up as a profit center for supplying pantry meals and banquet meals which is negotiated with adminstration prior to cook/chill being installed, then administration will view the savings as the result of cook/chill as profit in the food service department, which is transferred upstream. The critical issue here is that savings only occur once but profits occur year after year after year.

I know this is an ambitious goal but it has always been one of my favorites. You can see from my note on your survey that the setting up and proper use of a test kitchen is probably the difference between a successful introduction and a disastrous one. By actually producing cook/chill food in the test kitchen and serving it to a section of the hospital, you can gain invaluable experience. This is what I recommended to Larry Strumpf at New York's St. Lukes Hospital and he has had a terrific week in his test kitchen program. It is, of course, the ultimate training tool for getting staff up and running on cook/chill and avoiding culture shock (cook/chill versus conventional). It is especially important in training the cooks. And it isn't an expensive proposition.

That is all I have time for right now but if you would like to call me and talk about your survey, I would love to go over it with you.

Yours truly,

Jay Nichols

Jay Nichols
President

JN:hm

ELSEVIER
SCIENCE PUBLISHERS LTD

Claudia G. Green
The University of North Carolina
at Greensboro
School of Human Environmental Sciences
Dept. of Food, Nutrition and
Food Service Management
322 Stone Building, UNCG
Greensboro, NC 27412-5001
U.S.A.

19 February 1992

Dear Ms. Green,

Thank you for your letter of 16 January 1992 concerning permission for use of material from 'Cook-chill Catering: Technology and Management'.

We should be happy to grant permission for use of this material in your thesis provided you give full acknowledgement of the original source, however, if this material is intended for wider publication, you will need to have the permission of the author additionally.

As requested in your letter, Nicholas Light's address is:

Dr. Nicholas Light
Johnson & Johnson
Medical Biopolymers Group
The Alfa Centre
Stirling University Innovation Park
Stirling, SCOTLAND
SK9 4NF

Yours sincerely,

Robert Lomax
Publisher

January 16, 1992

Amelia Catakis, R.D.
Director of Professional Services
Healthcare Services Division
Food and Services Management
Marriott Drive
Washington, D.C. 20058

Dear Ms. Catakis:

I am currently involved in conducting my dissertation research on the use of cook-chill food production in hospital foodservices. The purpose of my research is to provide foodservice directors a systematic model for making the decision to select or not select cook-chill.

In order to collect data on factors considered to be important in the decision to select cook-chill, I am sending a survey to users of the cook-chill process. As a professional, you are probably aware that we all received several surveys per month. These surveys do not always get the highest priority by people who have a busy hectic schedule.

To reduce the incidence of lack of response to the survey, I want to offer an incentive to respondents. I would like to offer an opportunity for people returning the survey in a timely fashion. I would like to offer each respondent a chance to win in a drawing a $100 gift certificate to be used at any Marriott location in the U.S.

The purpose of this letter is to ask if Marriott would be willing to contribute a gift certificate in the name of research. If this would not be possible, would you consider a partial contribution: I would pay $50 for the $100 certificate?

I am currently enrolled as a Ph.D. student at Virginia Tech in the Hotel, Restaurant Institution Management program. In addition, I teach foodservice to dietitians and foodservice managers at the University of North Carolina-Greensboro. I would appreciate any assistance you give in providing this incentive. I am sure that a chance at at Marriott gift certificate would be a valued incentive that would increase participation in this research study.

If Marriott is willing to participate, I will gladly include the Marriott name in any publications and presentations I make on the topic of cook-chill food production in hospital foodservices.

Cordially,

Claudia G. Green, M.S., R.D.

CGG:vlb

APPENDIX D

Example of Use of the Generic Model

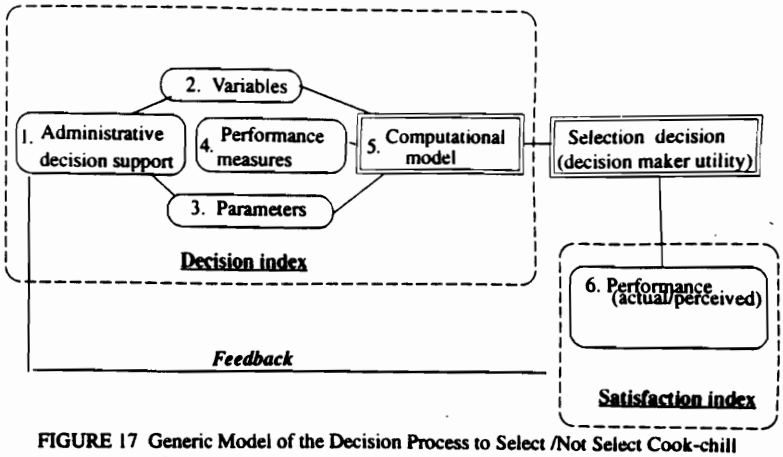


FIGURE 17 Generic Model of the Decision Process to Select /Not Select Cook-chill Food Production for Hospital Foodservices

The generic nature of the model of the decision process developed in this study permits it to be applied to a variety of decision processes. For simplicity and clarity, the example provided here will be unrelated to the foodservice industry and will apply to an everyday decision made by college students. The example is based on the decision of a college junior as to whether he should live in the dormitory on campus or move into an apartment off campus.

The first step in the decision process (administrative decision support) for the student is to evaluate the housing alternatives and to gather information on what is available. He has been living on campus for two years, therefore, he will spend most of his time and energy gathering information from the various apartment complexes. He may also find that he will need to get some input on his decision from his parents, particularly since that they will be providing a portion of the money for his room and board.

The second step (examining the variables) he will look at the variables associated with each alternative. For instance, should he get an apartment that has a swimming pool, exercise room, maid service, shuttle service to campus, ground level or second floor apartment, fireplace, study hall, and/ or cable hook-ups?

In the third step (establishing parameters), he will need to make a list of decision factors that can be expressed in quantitative terms such as apartment rent cost including projected expenses for: utilities, phone expense, cable expense, food expense, and gasoline for traveling to and from campus.

In the fourth step, he will calculate performance measures based on the use of parameters. This process constitutes the preparation of a budget based on parameters evaluated.

In the fifth step (the computational model), the student will consider the variables, parameters, and performance measures. He will balance and weigh the assets of each. To this step, he will also add the subjectivity utility of the decision, his own personal bias for making one decision over the other.

During the selection decision, the student will consider the utility of each decision alternative and will determine which trade offs he is willing to make.

Finally, satisfaction with his decision will be based on whether he was able to meet his expectations with regard to his decision. For instance, was he able to keep with the budget he had set? Is living in off campus better for his study habits? Did he have to take a roommate to help cover expenses?

It has been demonstrated by this example that the model of the decision process has application to any type of decision. The purpose of this research is to adapt the model for use in the decision to select/not select cook-chill food production in hospital foodservices.

VITA

Claudia Gill Green, daughter of Clifford and Hazel Gill, was born in Houston, Texas on September 20, 1949. Her educational background includes a B.S. in Food, Nutrition, and Foodservice Management in 1975 and a M.S. in Nutrition and Managment in 1977 from the University of North Carolina Greensboro. In 1977 she was registered as a dietitian by the American Dietetic Association. Presently, she is completing the requirements for the Ph.D. degree in Human Nutrition and Foods at Virginia Polytechnic Institute and State University. She is also on full time faculty as Program Coordinator of the Restaurant and Institution Management concentration in the Department of Food, Nutrition, and Foodservice Management at the University of North Carolina Greensboro.

Claudia has been involved with teaching and training in the area of food, nutrition, and foodservice since 1975. She has played an integral role as the University of North Carolina liaison with the North Carolina School Foodservice where her role has been to provide and assist in the training of child nutrition employees in North Carolina. Claudia has studied extensively in the area of institutional foodservice: schools, colleges/universities, hospitals, etc. She has provided numerous professional presentations at national and international meetings on the topics of technology, marketing, management, service, and decision making in the foodservice industry.

Her professonal background includes a position as Assistant Director of Nutrition of the Guilford County Health Department where she administered a federally funded nutrition program for women, infants, and children. In addition, she has been an entrepreneur in the foodservice business as she owned and managed her own restaurant, bakery, and catering company. She has had over 10 years of teaching experience in foodservice industry.

Claudia G. Green

Decision Making Strategy in the Selection of
Cook-chill Production for Hospital Foodservices

by

Claudia G. Green

(Abstract)

Committee Chairman: Mahmood Khan, Ph. D.

Human Nutrition and Foods
Division of Hotel, Restaurant and Institutional Management

The primary purpose of this study was to develop and test a model for the process of making the decision to select/not select cook-chill for hospital foodservices. A second purpose was to determine the nature of the decision strategy, analytical versus intuitive, most predictive of satisfaction with cook-chill.

A generic decision model was developed based on an extensive review of literature on decision making. Due to the lack of research on foodservice systems, a modified Delphi technique was used to identify 1) the factors critical in the process of making the decision to select/not select cook-chill and 2) the characteristics of a successful hospital cook-chill operation. The information gathered from the Delphi technique was used to develop a questionnaire which would measure the applicability of the generic model to the decision to select/not select cook-chill food production.

The generic model was composed of five decision components and one satisfaction component. Using the model as a framework, a questionnaire was developed to test the relationships between the components of the model. Correlations between these components revealed that the use of the model was significantly related with satisfaction with the decision to select/not select cook-chill.

A "Checklist for the Process of Making the Decision to Select/Not Select Cook-chill Food Production for Hospital Foodservices" was developed using the model and questionnaire as frameworks. The Checklist consists of 136 questions: 101 questions measuring the decision process and 35 questions measuring satisfaction with the decision. For the purposes of this study, analytical decision making was defined as a process where objective, as opposed to subjective information, was available and was used in the process of making the decision.

The Checklist consisted of questions to which there was a "yes" or "no" response. The higher the number of "yes" responses on the decision component questions, the more analytical the decision process and the higher the correlation with satisfaction. It was statistically determined that 37 "yes" responses resulted in satisfaction with the decision process. The lower the number of "yes" responses on the decision component questions, the more intuitive the decision process and the lower the correlation with satisfaction.

The results of this study are significant in that an extensive review of literature between 1950 and 1990 showed that there was little empirically based research on foodservice systems. The existing research prior to this study did not provide enough information to develop a model for the process of making the decision to select/not select cook-chill production for any foodservice operation. The model developed and tested in this research is generic in nature and should apply equally well in a variety of types of foodservices. It may be necessary to make minor adaptations to the Checklist to address the unique nature of various types of foodservices such as schools, colleges/universities, military, prisons, hotels, and restaurants.