LITERATURE REVIEW

Pattern of Management and Production of Thai Kitchen

I. The element of the foodservice business success

A successful food and beverage business depends on the vital factors. Lattin (1995) identified five distinct elements (the five'Es) of the foodservice business success as:

Excellent environment : a good location is a good starting point of the operation. A restaurant has to be located in or near a community or near important intersections. Furthermore, the operators must also consider the restaurant building and grounds, especially its cleanliness, restrooms, and outside environments.

Excellent service : the best illustration of excellent service of restaurant is that the customers want to revisit because they feel welcome. If the manager is dedicated to giving friendly service and is courteous to employees and customers, then this in turns will encourage the employees to be friendly and to make customers feel welcome too.

Excellent food and beverage products : the excellent food that is served under excellent service will taste better, look better to the customer than the same food served somewhere else and receive favorable comments from the customers.

Excellent value : the customers want to feel that the food and service they get are worth the price. Thus, excellent value is in the mind of the customer.

Excellent management controls : management controls is expected to yield competitive prices ; to ensure that what is purchased is received, and that what is received is properly stored and issued; to ensure that the products are prepared and served properly. And that all income is collected, that all money is deposited in the bank, and that all bills are paid (Lattin, 1995).

The successful foodservice business not only involves the good location, proper serving and excellent food, but also good management. To achieve the operating goals, all food or beverage operations have control points which must be managed. These control points include menu planning, purchasing, receiving, storing, issuing and producing.

II. Menu

A menu is a list of food and beverage items (Mc Vety *et al*., 2001). The heart of the primary control of the foodservice system is the menu. It controls the procurement and production subsystems and provide the framework for the budget. Therefore, it determines the items to be purchased, food cost, the operating personnel and facility requirements, and, the types of service that will be offered. Moreover, it also determines the layout of the kitchen (Spears and Vaden, 1985; Knight and Kotschevar, 1989). The plan and design of a menu must attract customers to the front of the house and must encourage them to return.

A. Categories of menu : a foodservice professional must first identify the category of menu to be used. However, all menus can be categorized by how the menu items on them are listed and priced (Ninemeier,1990). There are five categories of menus:

1. A'la carte menu : this menu is favored in many high-class hotels and restaurants. It is often adapted in other catering establishments and can be offered in conjunction with a table d'hote menu (Anderson and Blakemore,1991). Everything on the menu is priced separately, from appetizers to desserts (Mc Vety *et al*., 2001).

Therefore, the customers can compile his own menu. A true a'la carte dish should be cooked or prepared or prepared to order, the customer should be prepared to wait for this service (Kinton and Ceserani, 1984).

2. Table d'hote menu : this menu is a very popular type and is found in many types of foodservice outlets (Anderson and Blakemore,1991) . This type of menu offers a complete meal at a set price. A choice of dishes may be offered for all courses; the choice and number of dishes will usually be limited. This menu is usually ready for service at a set time (Kinton and Ceserani,1984; Anderson and Blakemore, 1991).

3. Plat du jour menu (Dish of the day) : this menu items can be offered with a' la carte menu or table d'hote menus and are dishes which are offered apart from the usual menu. They can be any course on the menu, but they tend to be mostly main courses, priced separately when combined with and a' la carte menu and sometimes with a supplementary charge on a table d'hote menu (Anderson and Blakemore, 1991) .

4. Carte du jour menu (Card of the day) : this type of menu contains a number of dishes, usually seasonal, which are not offered on other menus used. Some restaurants offer the carte du jour in place of the table d'hote menu. In conjunction with an a' la carte menu, the menu items would be priced accordingly (Anderson and Blakemore, 1991).

5**.** Special party menu : these are menus for banquets and parties of all kinds (Kinton and Ceserani, 1984).

B. Menu planning : in planning a menu must take into account not only the preferences of the customer, but also the financial goals of the foodservice operation, therefore, menu planners must consider the factors that concern the clientele and management for success of the business.

There are several factors affecting menu planning as following.

1. Client consideration : according to Spear and Vaden (1985) customer consideration should be taken into account. The consideration includes:

a) Sociocultural factors : food habits and preferences of the target customers must be considered in planning the menu. In addition, cultural food patterns, regional food preferences and age of customer are also related to the consideration. Individual food habits are determined by the interaction of environmental, physical, and psychological factors with previous food experiences ; age, sex, culture, race, religion, economic and social status, and geographic area of residence are also contributing factors. Restaurant and institutions conduct a periodical survey to determine popular menu offerings in the foodservice industry. Menu planners should analyzed food habits and preferences of the target clientele to provide data for planning menu.

b) Nutritional requirements : nutritional needs of the consumer should be considered in menu planning. Menu planners may turn to a dietary guideline for consumers in order to provide appropriate portion size and menus that include a variety of food in diet; limiting fat, sugar, and sodium intake; and increasing fiber consumption as the case may be. Normally, the dietary guidelines specify nutrient needs for various age groups by sex.

c) Esthetic factors : menu must consider a variety of flavors, textures, colors, shapes, and methods of preparation within a meal to please customers. Food of the same or similar flavor should generally not be repeated in a menu.

2. Managerial considerations : the type of foodservice system is a primary factor in all managerial considerations relating to menu planning. The menu may be limited by the amount of time available for food preparation and by the availability of food and labor. In designing menu, a number of management related factors must be considered : budget by considering food cost and availability by

of foods, and production capability by considering equipment, personnel, and type of service (Spears and Vaden, 1985).

3. Budget : menu planning must recognize financial constraints. All catering operations aim to make a profit, so menus should be planned to fall within budgetary limits. The menu is a major determinant of the cost of goods sold in a foodservice operation, the manager and menu planner must be particularly aware of menu item cost, both raw food cost and portion cost of prepared food (Spears and Vaden, 1985). Ashley and Anderson (1993) stated that the following suggestions are applicable to catering operations restricted to a tight budget.

a) Where possible, use a tried recipe that has been put on to a standard recipe card, being careful to watch out for ingredients which fluctuate in price.

b) Record the number of dishes produced and sold to gauge the amount of waste, and adjust the menu if necessary.

c) Monitor hired labor. If an operation is understaffed and the preplanned menu cycle cannot be adhered to; temporarily replace dishes that may not be cost-effective.

e) Aim to have over only a few portions of each prepared dish. These are suitable for staff meals.

f) Portion control must be agreed upon and strictly adhered to by all staff.

g) Use foods which are in season and / or when available at attractive prices. Contact supplier who will give information about price increases or reductions.

h) Keep an accurate record of stock rotation (inventory) to avoid last-minute small orders which cannot be purchased at the discount rates applicable to bulk purchases.

4. Production capability : to determine the menu item, a menu planner must consider several resources such as equipment , personnel, and type of service for producing the given menu. These factors have a direct impact on planning what can be offered

a) Equipment: the menu planners should plan types and capacity of the in the kitchen to balance the use of equipments (Spears and Vaden, 1985; Knight and Kotschevar, 1989; Ninemeier, 1990). Refrigeration and freezer capacity must also be considered. Equipment should not be overloaded so that it is prevented from operation to its maximum potential (Ashley and Anderson , 1993).

b) Personnel : the number and skill of kitchen staff at a given time must be considered for determining the menu produced (Ashley and Anderson,1993; Spears and Vaden,1985; Knight and Kotschevar, 1989). Menu item selection must also spread the workload evenly among kitchen personnel. Menu planners should also plan the menu according to the skill of the staff.

c) Types of service : the plan and design of the Menu must suit the types of service. A restaurant with table service will have a different menu than a self-service operation or a cafeteria. equipment for holding and serving will affect the menu selections that can be offered. Moreover, the impact of menu items and combinations on the dish room capability should also be considered because certain menu items may require special serving equipment (Spears and Vaden, 1985).

C. Menu schedules : menus can also be categorized by how often they are used. Menu schedules can be classified into two groups:

1. Static menus (Fixed menus) : a static menu is one in which the same menu items are offered day after day. Restaurants such as coffee shops and chain restaurants often use a single menu for several months (or longer) before replacing it with a new fixed menu. The menu is static, with a few limited choices of a'la carte item, the décor rustic and service consistent with the menu concept. In many national franchises and chains, the same basic menu is offered nationwide, thus permitting cost control, advertising campaigns, planned purchasing, and production control not possible in operations offering more varied menus. Customers frequenting these operations know what to expect and are familiar with the menu choices provided. In many commercial foodservices, a static menu may be offered with daily specials added to the offerings to provide variety and seasonal features (Spears and Vaden, 1985; Ninemeier, 1990).

2. Cycle menus : a cycle menu is a series of menus offering different items from day today on a weekly, fortnightly, or some basis, after which the cycle is repeated (Spears and Vaden, 1985). Cycle menus are very effective method of achieving well-balanced menus without repetition. After each completed sequence, it will generally be found that wastage will reduce, ordering of stock will become more efficient and staff will be more familiar with serving and preparing required dishes. When a cycle menu is being used, it is useful to keep an accurate record of portions and amount of stock sold to assist in ordering (Ashley and Anderson, 1993). Furthermore, establishing the right cycle length is important. With too short a cycle, the menus may repeat too often and guests may become dissatisfied. If a cycle is too long, production and labor costs involved in purchasing, storing, and preparing the greater variety of foods may be excessive. The optimum cycle length varies by type of operation and how often its guest are expected to eat there (Ninemeier, 1990).

III. Purchasing

Purchasing is a procedure concerned with the acquisition of food ; it is often described as obtaining the right product, in the right quantity, at the right time, at the

right price and with the right supplier. To do this, the food buyer for institutional and commercial foodservices must know the market and the products, in addition to having general business, astuteness. He or she can also rely on sales representatives, however, to give advice on valuable purchasing decisions and to rely valuable information about available food items and new products (Spears and Vaden, 1985; Ninemeier, 1990).

A. Purchasing procedures : purchasing procedures are adapted to the particular needs of the various departments of an organization. However, the image of the elementary purchasing procedures is limited several fundamental procedures appearing in some form in virtually every purchasing unit (see Figure 1). These procedures are not complex and should be eight essential steps listed (Spears and Vaden, 1985; Ninemeier, 1990).

1. Recognition of a need : in the organizations wherein purchasing has inventory responsibility, a need for ordering a particular item may be recognized when the inventory reorder level is reached. Recognition of a need should be followed by initiation of action to remedy the deficiency, namely, preparing a requisition.

2. Description of the needed item : in most organizations, the production unit cooks, having recognized a need for a particular item, initiate a requisition to the storeroom for the required amount of the item. If this requisition brings the inventory stock below the acceptable minimum, the storeroom personnel will initiate another requisition to purchasing for replenishment of the item to the desired inventory level. In any case, the requisition must contain an accurate description of the desired item and the needed quantity.

3. Authorization of the purchase requisition : in every organization, as a matter of policy, a clear delineation of who has the power to requisition material, supplies, and equipment is essential. Furthermore, the institution’s vendors should

be made aware of names of persons who are authorized to issue final purchase requisitions.

4. Negotiation with potential vendors : negotiation in purchasing is the process of working out a procurement and sales agreement, mutually satisfactory to both buyer and seller, and the process of reaching a common understanding of the essential elements of a contract.

5. Evaluation of proposals and placement of the order : all vendor proposals are evaluated for compliance with the preceding four fundamental steps in purchasing. The sequel to evaluation of proposals is the actual placement of an order.

6. Follow-up of the order : theoretically, a follow-up after the order has been placed and accepted by the vendor. A follow-up in a foodservice is justified when a specific delivery time of certain items is critical to an occasion. Most companies maintain a purchase follow-up system, usually involving color-coded copies of the purchase order.

7. Verification of the invoice and delivered material : the invoice is the vendor's statement of what is being shipped to buyer and the expected payment. The invoice should be checked against the purchase order for quality, quantity, and price. Without question, the delivery of materials and their condition on delivery should be in agreement with purchase order and the invoice.

8. Closure of the purchase record : closing the purchase record consists of the clerical process of assembling the written records of the purchase process, filing them in appropriate places, and authorizing for the goods delivered. While purchasing procedures vary from operation to operation, these basic steps are generally followed. As you can see, the purchasing process not only involves purchasing, but also receiving, storing, and issuing. Many people with various

responsibilities are required to get food and beverages to the food and beverage department for production.

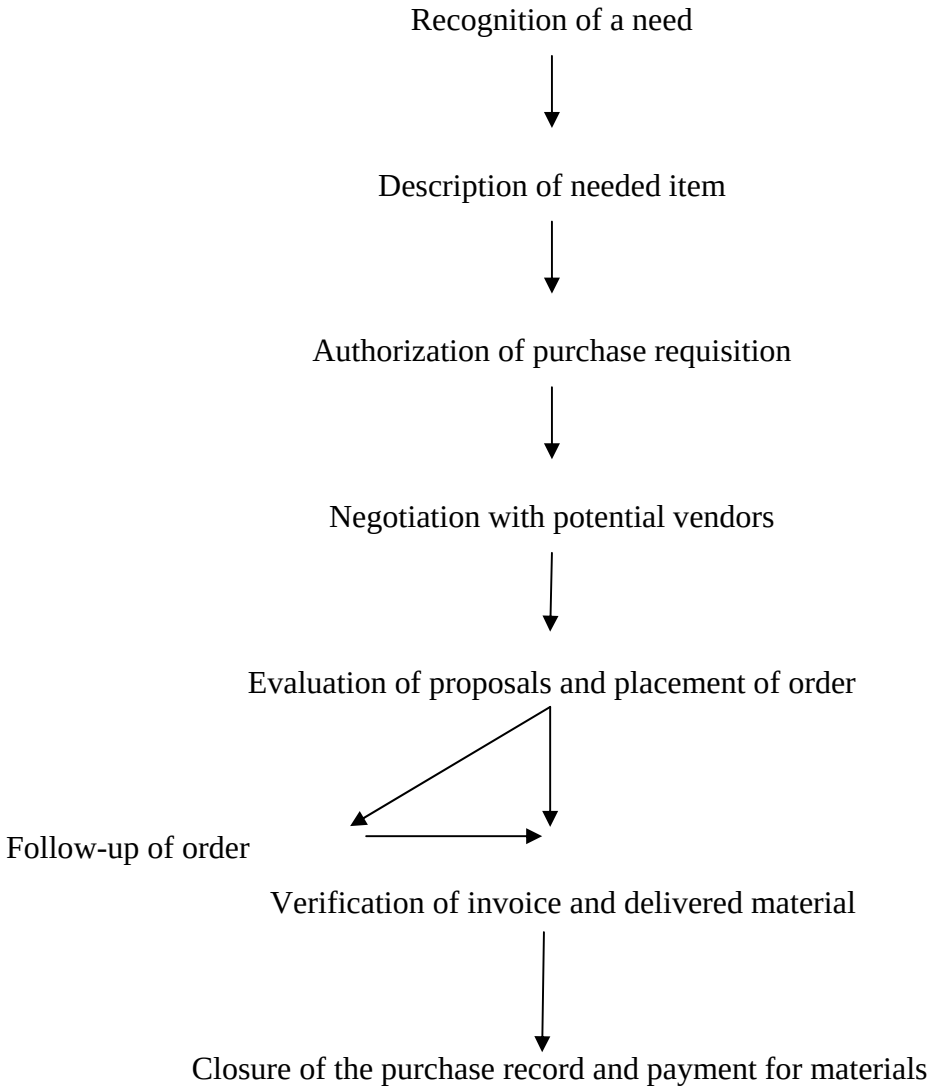

Figure 1 Fundamental steps in purchasing
Source: Spears and Vaden (1985)

B. The purchasing cycle : many activities make up the purchasing process. Food and beverage production employees need food, beverage, and other supplies to prepare menu items. They send requisitions (1)–written orders to withdraw items from storage–to storeroom personnel (see Figure 2), who then issue the requested products (2).

At some point, storeroom inventory – the amount of food, beverages, and other supplies on hand – will have to be replenished. To reorder supplies, storeroom personnel send purchase requisitions (3) to the purchasing department. Purchase requisitions are form that specify the products that need to be reordered, how many are needed, and how soon they are needed. The purchasing department, through either a formal purchase order system or an informal purchase record system, orders these products from suppliers (4). Copies of the orders are given to receiving and accounting personnel (5).

Suppliers deliver the ordered products to the receiving area (6) and give receiving personnel list of delivered product (their quantity and prices), and the total amount owed (invoice). Receiving personnel check the delivery against their copy of the purchase order or purchase record, and also check for such things as unauthorized substitutional and damage.

After the delivered product have been checked and accepted, they are transferred to the proper storage areas by property employees (7) and the delivery invoice is sent to the accounting department (8). This alerts accounting personnel that the supplier has delivered the products and they can process the necessary documents and pay the supplier (9).

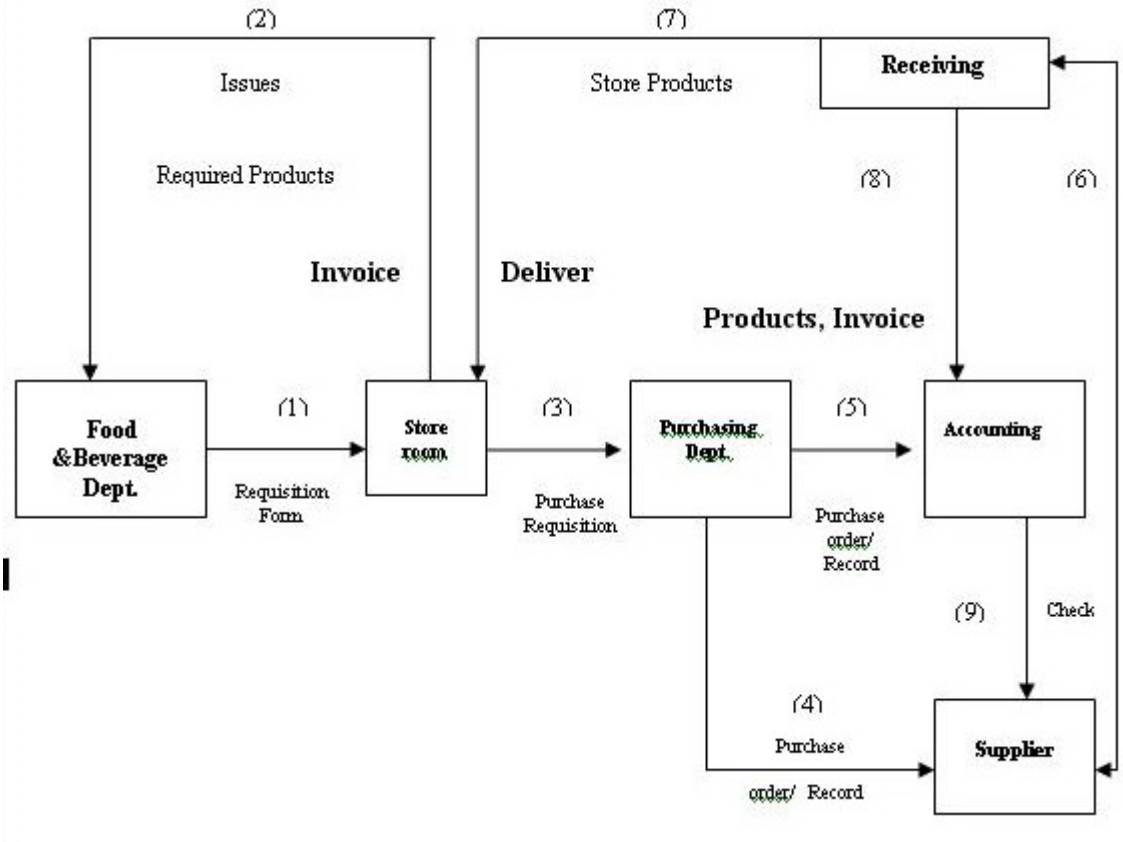

Figure 2 The Purchasing cycle
Source: Ninemeier (1990)

C. Buying methods : buying methods depend both on type of operation and the buying market. Generally, buying methods can be grouped under two heading : formal buying methods, and informal buying methods (Knight and Kotschevar, 1989).

1. Formal buying : formal method, also known as competitive buying, involves giving vendors written specifications and quantity needs. The invitation or request for bids may be made through newspaper advertising or by sending selected vendors a notice of buying need. Three formal methods are most common : the competitive-bid method, the negotiated method, and the futures-and-contract method.

a) The competitive–bid method : in competitive bidding, sellers are invited to submit bids through some type of written communication. The vendors, in turn, send prices and other requested information on the commodities to the buyer. Bids are opened at a specified time to determine awards. Only sellers that can meet the established purchase conditions of the buyer are considered in awarding bids.

b) The negotiated method : negotiated buying is often used when vendors are hesitant to bid because of time restrictions, fluctuating market conditions, or high perishable of the product. The negotiated method allows for quicker action because it is less rigidly structured than other formal methods. This method is flexible.

c) The futures-and-contract method : futures-and-contract buying is often used by large businesses that have sufficient capital and staff to contract for future delivery of commodities at an established bid price. The advantage of this system is that an adequate supply at an established price can be arranged in advance. As a result, problems with shortfalls the price fluctuations that otherwise could affect the availability of items required for the menu can be avoided. In some cases, the quantity desired under contract may vary, so the contract may specify that the amount purchased depends on the amount used during the relevant period. A price may be agreed on, along with quality and other factors, but the specific quantity to be used is not set. Deliveries then depend on the inventory on hand. In some case, the purveyor drops by the operation regularly to bring the inventory of the operation up to a pre-established level. Either arrangement is often called par stock supplying. It is important in par stock supplying to maintain a safety stock – a quantity of the item sufficient to tide the operation over between the time of reorder and the time of delivery. This system is often adopted to handle daily–order items. All deliveries must be checked and all products rotated forward, leaving the newer stock to be used after the old stock is expended.

2. Informal buying : this buying method, also called open-type buying, is the one most often used by small foodservice operators. This type of the buying usually involves oral negotiations. In using this system, buyers should obtain comparative prices from at least three to five different suppliers. While informal methods may vary from locale to locale, there are generally three types of methods used.

a) The quotation-and-order-sheet method : the Quotation-and-order-sheet method use a tabulation of particular commodities wanted, in the quantities and quality needed. These specifications are usually listed in a columns on the left-hand side of a sheet. Additional columns are available to record the prices quoted by various purveyors. When as many prices as desired have been obtained, the prices are studied. A decision is then made to purchase something from a particular purveyor, and the price for that item is circled. Last , a secretary or clerk calls the purveyor to place the orders.

b) The blank-check methods : blank-check buying can occur when there is an extreme shortage of a commodity on the market or when some other condition exists that necessitates buying a item almost regardless of its cost.

c) The cost-plus method : the cost-plus method is often used in situations where price are not known or where the market is unstable. Many vendors prefer this arrangement, since they do not have to add a safety factor to avoid the risk of losing money on commodities that fluctuate considerably in price.

IV. Receiving

Receiving can be defined as a process for ensuring that the product delivery by vendors are those that were ordered in the purchasing process (Spears and Vaden, 1985). The benefits of an excellent purchasing plan are lost because of poor receiving. Food cannot be sold profitably if it arrives in short

weight or poor condition, or if it does not arrive at all (Knight and Kotschevar, 1989).

Elements of good receiving practices include competent personnel with specified responsibilities, proper facilities and equipment, well-written specifications, good sanitary practices, adequate supervision, scheduled receiving hours, and procedures to ensure security (Spears and Vaden, 1985).

A. Competent personnel : responsibilities for the receiving function should be assigned to a specific member of the foodservice staff. The person responsible for the receiving should not be involved in food purchasing or production. Ninemeier (1983) delineated the following skills and abilities for receiving employees: know the quality specifications for each product, know how to evaluate quality of products, understand all steps in the receiving process, know process to follow when problems occur with an incoming shipment of food or supplies, and know procedures for completing required receiving forms and maintaining adequate records. Moreover, the receiving personnel must be able to detect old merchandise, excess shrinkage, short weight, and foods not meet specifications.

B. Facilities and equipment : adequate space and equipment are necessary to perform receiving tasks properly. Spears and Vaden (1985) point out the receiving room should be located near the delivery door, storeroom, refrigerator, and freezers to minimize the time and effort in movement of food into appropriate storage.

The material flow from receiving to storage and to processing should be as short as possible and cause a minimum of interruptions in production area. The space allocated for receiving should be ample enough to allow all products in a delivery to be inspected at one time. The size of the receiving area for a specific food facility is influenced by the nature and volume of materials received or being transferred out at any one time (Spears and Vaden, 1985).

The receiving department requires certain equipment, including scales in good working order. Both platform and counter scales should be available. Accuracy of all scales should be check periodically. Other equipment in the receiving area should include a table for inspection of deliveries and tools, such as a can opener, crow bar, claw hammer, and short bladed knife for opening containers and packages. A thermometer to check whether chilled or frozen products are delivered at the appropriate temperature according to specification, and clip boards, pencils, and marking and tagging equipment are also necessary. Finally, in addition to the desk, a file cabinet should be available for storing records and reports, as well as a calculator for verifying the computation on the invoice (Spears and Vaden, 1985).

C. Specification : the person who receives orders should know the standards the vendors must meet and should have a notebook or file box of specifications available for reference. All deliveries should be checked against these specifications and nothing below the standard should be accepted (Spears and Vaden, 1985).

D. Sanitation : proper sanitation is a prerequisite in this area, so receiving facilities should be arranged for case in cleaning. The floor should be a surface that can be easily scrubbed and rinsed, with adequate drains and a water connection nearby to permit hosing down the area. Electrical or chemical devices for destroying insects are often mounted near the outside doors in the delivery area (Spears and Vaden, 1985) .

E. Adequate supervision : the management of a foodservice operation should monitor the receiving area periodically, although at irregular intervals, to check security in the area and to ensure that established receiving procedures are being followed (Spears and Vaden, 1985).

F. Scheduled Hours : vendors should be directed to make deliveries at specified times. This policy makes it easier to avoid the confusion of too many deliveries arriving at the same time and ensures that deliveries will not arrive at inopportune times (Spears and Vaden, 1985).

G. Security : at the time products are received several practices should be followed to guard against theft. Thus, in order to avoid the mishap receiving tasks should not be performed by the person responsible for purchasing. Another practice is to move products immediately from receiving to storage. In addition salespersons and delivery or route persons should generally not be permitted in storage area.

The Receiving process : Incoming merchandise should be received properly, so detailed procedures are important to assure. Receiving procedures may vary with different foodservice companies, but the following general steps in the process are standard (Spears and Vaden, 1985; Knight and Kotschevar, 1989; Ninemeier, 1990) :

Step 1 : inspection against purchase order. Inspect incoming products against purchase order (used at large properties) or a purchase record (used at small properties). These documents identify the product, quantity, unit cost, and total cost of the order. In addition, a purchase order may include other contractual information such as guarantees, warranties, payment requirements, and inspection rights.

Step2 : inspection against a purchase specifications. Inspect incoming products against the purchase specifications to confirm that the quality of the incoming products meets the operation's standards.

Step 3 : inspection against the invoice. Inspect incoming products against the delivery invoice prepared by the vendor. The invoice is the vendor's statement of what is being shipped to the foodservice operation and the expected payment. In invoice receiving, if the quantities and prices are correct and the receiving employee has attested to quality, the invoice should be signed. Generally, two copies of the invoice are required, one for foodservice records and the other for the accounting office.

Step 4 : acceptance or rejection of the orders. The delivered products become the property of the foodservice operation when their comparison with the purchase order or other purchase record, the specifications, and the vendor's invoice reveals no problems or when problems have been corrected or noted on the invoice. Payment then will be due at the agreed upon time for items charged on the invoice. Spears and Vaden (1985) referred to Ninemeier (1990) who lists several reasons that products should be refused such as, not the ordered items, not the required quality products, not the quoted price, and not the delivered product on timely basis. Rejection at the point of delivery is much easier than returning items after they are accepted.

Step 5 : removal to storage. After products have been received, they should be removed immediately to proper storage for quality and security reasons. The products should be tagged or marked on the outside of a case or package in order to indicate the receiving record such as date of receipt, name of vendor, brief description of merchandise, weight or count when received and place of storage. Tagging merchandise also facilitates stock rotation to ensure that older merchandise is used first, particularly important with perishable food products.

Step 6 : complete the daily receiving report or other forms as required. A daily receiving report helps managers keep track of the items that are received from suppliers each day.

V. Storage

After commodities are purchased and received, they must be stored. Ninemeier (1990) pointed out that storage policies must address three issues : security, quality, and record keeping.

A. Security : storage security measures should control factors such as lockable storage areas, precious storage, limited access, effective inventory

control procedures, central inventory control, secure design, and lighting and monitoring.

B. Quality : basic storage procedures that safeguard quality include the following:

- Rotate food stocks : Items which have been in storage the longest should be used first. This concept is referred to as first-in, first-out (FIFO).

- Store foods at the proper temperatures. Use accurate thermometers in storage areas to ensure that : (1) refrigerated storage temperatures are kept between 32ºF and 40ºF (0ºC and 4ºC).

(2) dry storage areas are kept between 50ºF and 70 ºF (10ºC and 21ºC).

(3) frozen items are kept in freezers with temperatures below 0 ºF (18 ºC).

The temperature must be checked regularly and adjusted accordingly.

- Clean storage areas. Routine cleansing of all storage areas helps product quality.

- Ensure proper ventilation and air circulation. Keep items off the floor and away from walls to permit air circulation.

C. Record keeping : an operation must keep track of the quantity and value of the products it has in storage. The Manager has to know what is in inventory in order to know what should be ordered. The value of products in inventory is used to calculate the cost of goods sold when income statements are developed. Record keeping is also important in controlling theft. There are two basic systems for keeping track of inventory : the perpetual inventory system and the periodic inventory system.

1. Perpetual inventory system : a perpetual inventory is the process of maintaining a continuous record of all purchases and food issues. A perpetual inventory system's concept is identical to the way a check book record is maintained. The process provides a continuous record of the quantity on hand at any given time in storage, as well as the value of food and supplies. The amount of product must be confirmed at regular intervals (usually monthly) by a physical count. For control purposes, the person who conducts the physical inventory should not be the same person who maintains the perpetual inventory records (Spears and Vaden, 1985; Ninemeier, 1990).

2. Periodic inventory system : when a periodic inventory system is used, the operation does not keep track of what is added and subtracted from inventory on a ongoing basis. A periodic inventory system relies on physically counting what is in storage on a periodic basis. Normally, inventories are counted once a month, usually at the end of the month. An advantage of the periodic inventory system is that it avoids the trouble and cost of the paperwork involved with the perpetual inventory system. A disadvantage is that food cost information can only be figured out for each month. With a perpetual inventory system, food costs can be figured out for each day or any combination of days.

Since there are advantages to each inventory system, managers at many operations use both to keep track of inventory. One uses the perpetual inventory to keep track of expensive or otherwise important products in inventory, because keeping close control of them is worth the trouble, cost of the paperwork and labor involved. Inexpensive inventory items on the other hand are kept track of quickly and easily by physically counting them on a regular basis, typically at the end of each month i.e. periodic inventory is used.

D. Type of food storage : proper storage maintenance, temperature control, cleaning and sanitation, and stability are major considerations in ensuring quality of stored foods. Storage is also important to the overall operation of the foodservice system because it links receiving and preparation. Dry and low temperature

storage facilities should be accessible to both receiving and food production areas to reduce transport time and corresponding labor costs (Spears and Vaden, 1985). A storeroom should be planned to promote smooth workflow, case of maintenance, good security, and the preservation of value (Knight and Kotschevar, 1989). The correct storage temperature and storage humidity vary for different foods. Types of storage can be offered : dry, refrigerated and frozen or low-temperature storage.

1. Dry storage : the dry food storage area provides orderly storage for food not requiring refrigeration or freezing. Temperatures in the dry storage area should be between 50 ºF and 75º F (10 º C and 24 ºC), with a minimum of 40 ºF (7 ºC) and maximum of 80 ºF (27 ºC) (Knight and Kotschevar, 1989). This area should provide protection of foods form the elements, insect, rodents, and spoilage organisms as well as safeguard them from theft.. Soaps, detergents and other cleaning g supplies, insect powders, and rat and other poisons should not be kept in the food storeroom. A separate locked room should be provided for them, to prevent them from being mistaken for food products or contaminating the food. Foods should be stored off the floor and away from the wall. Bottom shelving level should be at least 10 inches off the floor to ensure adequate ventilation and freedom from contamination by floor soil or water, as well as, to allow for cleaning underneath. For adequate ventilation, all shelving should be at least two inches away from the wall, giving air room to circulate in the back (Knight and Kotschevar, 1989). Foods should be arranged systematically in the storeroom and every item assigned a definite place. In some storage systems, faster-moving items are placed near the entrance and slower-moving items are stored in less accessible locations. In other arrangements, foods are categorized into groups, then arranged either alphabetically or according to frequency of use within the groups (Spears and Vaden, 1985). Foods that give off odors should be stored separately.

2. Low temperature storage : sufficient and proper low temperature storage space is very important in a foodservice operation . This will vary with the

type of foodservice system, menu and purchasing policies. An excessive amount of refrigeration and frozen storage increase capital costs and operating expenses (Spears and Vaden, 1985; Knight and Kotschevar, 1989). Low temperature storage can be categorized into four functional types (Spears and Vaden, 1985).

- Coolers : medium temperature range storage designed to hold the temperature between a minimum 32 ºF and maximum of 48 ºF, used for thawing frozen food, storing meat at 32-38 ºF, storing dairy products at 36-40 ºF, and storing vegetables and fruits at 44-48 ºF.

- Thawers or tempering boxes : units for thawing frozen foods, specially designed to maintain a steady temperature of 40 ºF regardless of room or product load.

- Storage freezers : low temperature units that maintain a constant temperature in the range of -10 to 0ºF used for storing frozen foods.

- Processing freezers : unit designed to perform the actual freezing of food at temperature of -20 ºF or below, generally not used for storage.

In some foodservice operations, separate refrigerated units are available for meat and poultry, fish and shellfish, dairy products, and vegetables and fruits. Separate freezers may also be available for ice cream and for other frozen foods. Low temperature storage, usually, six factors dictate refrigeration needs : space needed, sanitation, air circulation, temperature, placement, and general practices and procedures. The space needed for refrigerated storage depends on the number of meals served, the type of service, merchandising practices, the food itself, and delivery schedules (Knight and Kotschevar, 1989). Clean refrigerated areas help reduce the risk of food loss. Air circulation is important, so food items should not be over crowded in the unit, and adequate space should be left between each product in order that cold air should reach all items at all times and temperatures in different parts of a refrigerated area may should

minimally vary. Satisfactory storage of various products can be maintained with fewer units kept at the following temperatures :

- Fresh fruits and vegetables at 40 to 45 ºF.
- Dairy products, eggs, meat, and poultry at 32 to 40
- Frozen foods at -10 to 0 ºF.

VI. Issuing

Issuing is the process used to supply food to the production units after it has been received. Products may be issued directly from the receiving area, especially if planned for that day's menu, but most food and supplies are issued from dry or low temperature storage. At the end of the day or recording period, the total value of goods issued should be known. This value plus the value of direct deliveries gives the value of foods used during the period. The issuing process entails control of food and supplies removed from storage and provides information for food cost accounting. Practically, there are two methods of issuing :

A. Direct issuing : issues sent directly from receiving to preparation or production without going through storage are usually referred to as direct purchases or direct issues. In many operations, fresh produce are handled as direct issues.

B. Issues from storage : all foods that are received but not used the day they are purchased are storeroom purchases ; these products are issued from a storage area when needed for production or service. Control of issuing from storage has two important aspects. First, goods should not be removed from the storeroom without proper authorization and, second, only the required quantity for production and service should be obtained.

Issuing procedures will depend in part on what kind of record keeping system the operation is using to keep track of inventory. If an operation is using the perpetual inventory system for every item in storage, a requisition must always

be used to withdraw products from inventory. A requisition is a written order identifying the type, amount, and value of items needed from storage. Requisitions should be signed or initialed by an authorized official such as the chef. At the end of the day, the storeroom clerk or another employee may use the requisition forms that have been collected to update perpetual inventory records. These requisition forms can then be forwarded to a manager or to the secretary / bookkeeper for review and calculation of daily food cost information.

VII. Production planning

It is crucial to produce food and beverage products that conform to quality standards. Ninemeier (1990) stated that excellent service, an inviting ambience, and clean surroundings cannot overcome the negative effects of improper or ineffective production procedures. Managers must define quality standards for each product. Then, they must supervise and evaluate to ensure that standards are met. Personnel must be trained to follow standard procedures. Quality standards must be incorporated into production activities through standard recipes, purchase specifications, and proper tools and equipment.

Production planning is the first step toward providing dining experiences that meet or exceed customer expectations. Operations of all sizes need to plan for production in order to have food and beverages, personnel, and equipment available when needed. Production planning should always be tailored to the needs of the specific operation. The primary task of planning is to determine the quantity of menu items to be prepared. Many operations use sales history records to estimate production needs for the upcoming week. These records indicate for each date the total meals served, the number of portions of some or all menu items served, the weather, and special events or activities. Moreover, the culmination of production planning is the production schedule, which is a time sequencing plan of events required by the production subsystem to produce a meal. Scheduling involves two distinct stages, planning and action. The production schedule activates the production plan and constitutes a test of the forecasting

accuracy. Regular meetings with employees to discuss production schedules can improve functioning of the production unit.

A. Production schedule : the production schedule, called the production work sheet, is the major control in the production subsystem because it activated the menu. The menu must be based on standardized recipes. Furthermore, the process of preparing a work schedule sheet forces supervisors to think ahead of time about the work that needs to be done in their departments. A production schedule should made out the day before the items are to be produced to facilitate delivery of items from the storeroom and to simplify the day's production (Keister, 1990). When using a production schedule, employees can start right in production because they know what to prepare, how to prepare it, and how much to prepare. Thus, the food production schedule sheets for the day should already have been posted in the kitchen by the kitchen supervisor. Employees should be able to read posted production schedules immediately when they come to work. They should know right away what foods they should prepare and be able to go right ahead and prepare them without confusion or questions. Spears and Vaden (1985) described that the basic information of the production schedule must include : the production date, meal, and unit should be identified, as well as other pertinent information weather, special events, and actual meal count. In addition, the following information must be included to make it a specific action plan such as : employee, menu items, quantity to prepare, actual yield, special instructions and comments, preparation time schedule, overproduction and underproduction, substitutions, additional assignments and preparation.

B. Food production : food production comprises a number of functions that may be performed in one or more types of kitchens. The number of functions and the type of kitchen or kitchens depend on the characteristics of the specific operation large or small, cafeteria or table service, limited menu or extensive menu, and so forth (Ninemeier, 1990).

Typical major functions include preparing cold foods, cooking, baking, and preparing beverages. Each of these major functions encompasses other functions and has many applications. For example, there are many types of cooking methods for many types of foods. Cooking methods can be categorized as moist–heat and dry–heat.

1. Food production principles : according to Spears and Vaden (1985) food is basically cooked for three primary.

- To develop, enhance or alter the food's flavor, form, color, texture, and /or aroma.
- To increase digestibility.
- To destroy harmful organisms.

And Ninemeier (1990) stated that foods should be prepared according to basic principles. These include the following :

- Begin with quantity food, which is not necessarily the most expensive.
- Make sure food is clean.
- Make sure food is properly handled.
- Use proper seasonings.
- Use the right preparation techniques and equipment.
- Follow standard recipes.
- Don't cook in quantities that are larger than necessary.
- Serve food as soon as possible after preparation.
- Serve hot food hot and cold food cold.
- Make every presentation something special.
- Never be satisfied with a mediocre product. Always try to make it perfect.

2. Production control : Spears and Vaden (1985) concluded that production control involves comparing what we set out to do with what we did and taking corrective action if needed. Quality control means to assure of day-in, day-out consistency in each product while quantity control means producing the exact

amount required. Time, temperature, and portion control are important for quality and quantity, as well as cost control of the product.

a) Time and temperature controls : time and temperature are critical elements in quantity food production and must be controlled to produce a high quality product. Temperature is the common denominator for producing the correct degree of doneness. Temperature is controlled or monitored with the use of thermostats and thermometers. Timing is a critical element in all stage of food production and service. Excess moisture loss will occur in most products even if the temperature is correct, but the cooking time is extended. Various types of timing devices are available to assist in the control of time in food production process. Time and temperature are closely related elements in cooking and must be considered equally in setting up production controls.

b) Product yield : yield is the amount of product resulting at the completion of the various stages of the procurement / production / service cycle and is usually expressed as a weight, volume, or serving size. Production yield is related to time and temperature, and control of product yield is important to ensure the appropriate quantity is produced. Losses can occur at each stage of the procurement / production / service cycle. Handling losses occur not only during production, but also during portioning for service. These various losses must be considered in estimating quantities to purchase and produce.

c) Portion control : portion control is one of the essential controls in production of food in quantity. It is the achievement of uniform serving sizes, important not only for control of cost but also for customer satisfaction. It must begin with the purchase of food according to well–defined specifications and continue through production and service. Use of standardized recipes and appropriate techniques are components of portion control, as is selection and use of proper equipment for portioning and production. Portion control guides should be developed for use by production and service personnel.

e) Product evaluation : product evaluation is an important component of a foodservice quality control program. Food quality is evaluated by sensory, chemical, and physical methods. Large foodservice organizations commonly have a laboratory responsible for monitoring quality of menu items. All foodservice operations can use sensory evaluation effectively in the development of new menu items and in maintaining quality of menu items.

f) Control during food production : Ninemeier (1990) defined that the primary concerns of managers during food and beverage production are (1) to make quality ingredients available for food and beverage production, and (2) to ensure that quality requirements are met. Some control activities to preserve quality and maximize food production efficiency include the followings :

- Require that all standard cost control tools (standard recipes, standard portion sizes, etc.) be used.

- Make sure that weighing and measuring tools are available and always used.

- Ensure that only the amount of food actually needed for production is issued.

- Train personnel to constantly comply with required food production procedures.

- Minimize wasted food.

- Monitor and control employee eating/drinking practices.

- Make sure that items taken out of storage but not used are put back in secure storage areas.

- Inspect and approve items to be discarded because they spoiled in storage or weren’t properly prepared.

- Maintain production records ; use them for revising quantities of items to be produced in the future.

- Analyze sales and production records to determine how much income each menu item is generating.

- Study and resolve production bottlenecks.

- Study systems for managing equipment, layout and design, and energy usage. Implement procedures to reduce costs without lowering quality standards.

- Make sure that labor–saving convenience foods or equipment items reduce labor costs.

- Recruit, train, and schedule personnel who are genuinely concerned about preparing and offering high quality products that meet the property's standards.

VIII. Standard recipes

A standard recipe is a formula for producing a food and beverage item. It is a recipe that you have worked out and set up formally in terms of yield and quality for use in your establishment. When standard recipes are followed correctly, items served to customer will be consistent in quality, flavor, and portion size. This consistency creates customers' satisfaction and enables a food service operation to build a solid base for the business. Therefore, the recipe becomes a quantity and quality control tool constituting a standard for each menu item. A definite pattern or format should be used consistently for all recipes. Thus, a standardized recipe should specify the followings (Spears and Vaden, 1985; Kieister, 1990; Ninemeier, 1990):

- Name of food item
- Identification code
- Types and exact quantities of ingredients
- Procedure of preparation for everything
- Size of portion and portioning equipment
- Total number of portions to be obtained from recipe
- Garnish and any other information necessary for production and service of the item

Moreover, Smith and Crusius (1969) suggested that before writing recipes all operations and equipment should be standardized such as:

- Equipment and techniques for weighing and measuring
- Cooking facilities – oven space, steamer, etc
- Size of cooking equipment such as pan, pot, etc. in relation to yield
- Yields or size of serving
- Serving equipment to be used
- Ingredients
- Methods and techniques for mixing.
- Time and temperature controls.

In addition, Spears and Vaden (1985) concluded that recipe standardization is: the process of tailoring a recipe to a specific foodservice operation. In developing standardized recipes, careful testing and evaluation are important at each stage. Repeat batches of a recipe should be produced until at least three successful trials have consistency produced the quantity and quality desired.

Advantages of standard recipes (Smith and Crusius, 1969; Spears and Vaden, 1985)

- Saving of time of production and managerial personnel; standard recipes save time for both cook and manager, allowing more time and money for skill and finess in preparing, serving, and merchandising of food. They eliminate guesswork.

- Control of cost by reducing waste and regulating inventories; waste can be controlled by not over purchasing or overproducing. Inventories can be maintained at adequate levels and storage kept at a minimum.

- Promotion of quality and quantity assurance for foods produced; standard recipes eliminate variations in quality and quantity of product. The final product should be the same quality each time the item is prepared. Standard recipes reduce the probability of failures due to poor food handling and preparation and waste due to poor estimating of quantities.

- Facilitation of training of production employees; recipes with good procedures can be simplify the job of training a new worker.

- Simplification of determination of menu item costs; standard recipes assist in food cost control by providing a means of;

1) Figuring accurate cost of material used.
2) Estimating yield to be expected.
3) Checking losses and making necessary adjustments by use of fewer or cheaper materials.
4) Maintaining quality
5) Preventing leftovers.

IX. Design and layout

A. Size of the kitchen : area required and placement of the kitchen vary according to the type and number of meals provided and on the method of production. Calculating in advance the kitchen area needed is difficult, however, some experts believe that kitchen space per customer should be about one–half that of the dining room, Fuller *et al*. (1985) showed the followings :

Numbers eating in busiest period	Restaurant area In, sq m	Kitchen area In, sq m	Kitchen area desirable per customer
100	34.83	13.93	0.46 - 0.84 sq m.
100 to 250	51.02	19.97	0.37 - 0.56 sq m.
250 to 500	88.25	27.87	0.37 - 0.46 sq m.
500 to 1,000	139.35	45.45	0.28 - 0.37 sq m.
Over 1,000			0.23 - 0.28 sq m.

Katsigris and Thomas (1999) also suggested the following kitchen sizing guidelines;

- The restaurant kitchen is approximately one half the size of the dining room.
- Sizing by seat count :
  - Dining room
    Deluxe – 15 to 20 square feet per seat
    Medium – 15 to 20 square feet per seat
    Banquet – 15 to 20 square feet per seat
  - Back of the house (Kitchen)
    Deluxe – 7 to 10 square feet per seat
    Medium – 5 to 9 square feet per seat
    Banquet – 3 to 10 square feet per seat
    (add the banquet requirement to the kitchen)
- Food prep is approximately 50 percent of the back of the house.
- Storage is approximately 20 percent of the back of the house.
- Warewashing is approximately 15 percent of the back of the house.
- Wait staff circulation is approximately 15 percent of the back of the house.

Moreover, placement of the kitchen in the building is the important factor that will affect the quality of the food, the number of guests who can dine at any particular time of day, the roles of the servers, utility costs, and even the atmosphere of the dining area (Katsigris and Thomas, 1999). A poorly designed kitchen can make food preparation and service more difficult than it should be and it can even undermine the morale of the staff, therefore, the relationship between deliveries, kitchen and restaurant is important in order to provide the logical flow from deliveries to foodservice.

B. Access to the kitchen : the kitchen requires good access for the delivery of food and for the removal of waste. These access points should be separated and well away from guest entrances and exits. Fuller and Kirk (1991) points out the ideal entrances to the kitchen should be five different entrances such as:

- Staff entrance to cloakroom.
- Goods (merchandise) entrance to stores.
- Garbage / refuse removal.
- Waiting / service staff to restaurant.
- Waiting / service staff from restaurant.

In practice, this complexity is often not possible. Thus, an important aspect of entrances to a kitchen is security. The chef's or supervisor's office should have good visibility of as many of these entrances as possible. Kitchens should be located in cool part of the building. The distance and case of access between kitchen and dining areas should be considered. The work flow is necessarily complicated when one kitchen must service a number of food outlets in a building.

In addition, Fuller and Kirk (1991) described hygienic design of kitchen that there should be a straight line flow from materials to finished product, with no back tracking. The dirty (precooking) activities should be separated from the clean (post cooking) activities. The cloakroom including toilets for staff should also be provided possible prior to entrance of the kitchen. All materials and surfaces likely to come into contact with food would be easily cleaned, including the sides, behind and underneath equipment. Any spaces which cannot be cleaned would be sealed to prevent build – up of food and to eliminate insects and rodents. There should be no cracks, joints or screw heads on equipment and smooth curves should be chosen rather than internal right angle bends. The possibility of water back-siphoning should be prevented. The garbage removal area should be screened, provided with a hard floor surface sloping to a drain, and water supply should be provided for washing of containers.

C. Receiving area : is the area that merchandise were count and weighed, checked orders for accuracy, and refused or rejected incorrect and unqualified orders.

Katsigris and Thomas (1999) defined the factors that should be considered in creating this space such as volume of goods to be received, frequency of delivery

and distance between receiving and storage areas. Floor area and counter space should be allocated for temporary storage, where merchandise can be stacked until they are properly checked in. Weight scales, dollies or should be available and there should be sink and drain board for a quick rinse and inspection of incoming merchandise. In addition, there should also be a space for waste disposal. The absolute minimum receiving area space should be at least 8 square feet to allow room for a receiving table, a scale, a dolly or cart, and a trash can (Katsigris and Thomas, 1999).

D. Storage areas : required for a kitchen depended on the nature of the supplies such as types, quantities, delivery frequency, delivery containers, storage containers (Fuller *et al*., 1985). Different areas should be provided for dry goods and for refrigerated ones. All storage areas should be close to the receiving point and on the same floor level to facilitate the use of trolleys and carts. Typical recommendations for food storage varies between 15 and 25 percent of the kitchen area.

Vegetables (green leafy, tubers, roots etc.) : all kinds of vegetables should be stored and prepared in an area isolated from the kitchen so that soil brought in with them would not come into contact with other foods. The ideal storage temperature for most vegetables should be 9 - 12 ºC and the room should be ventilated (Fuller and Kirk, 1991). Vegetables packed close together in warm, unventilated corners will deteriorate rapidly. They will last much longer if stored on raised platforms with slats or on open mesh racks so that they are kept as cool and exposed to circulating air as possible. Racks or bins should be mounted at least 230 millimeters (9 inches) above the floor and fitted at the bottom with removable dust collection trays. Adjacent to vegetable section there should be an electrical operated peeling machine, a tank, a sink, and preparation tables.

A dry storage area should be available to accommodate such grocery items as canned and packaged goods. Its temperature should be 9-10 ºC. Conveniently arranged, adjustable shelving allowed maximum space utilization.

Having shelves mounted on wheeled stands assists convenient transporting supplies to the kitchen. Shelves should be at least 230 millimeters (9 inches) above the floor in case of cleaning. All bench work and shelving should be mounted at least 100 millimeters (4 inches) away from the wall for the same reason. The dry storeroom should be equipped with both platform and table weighing scales for checking, receiving and issuing of daily supplies. These scales should be positioned at the entrance of the storage area for convenience. The most frequent used goods should also be placed near the entrance. Dry storages should be lockable, well –ventilated, and long and narrow rather than square, in order to economize on floor space (Fuller *et al*., 1985; Fuller and Kirk, 1991).

As for refrigerating temperatures, there are two basic zones : -20 ºC (-4ºF) for frozen foods, and 0ºC (32ºF) to 4 ºC (39ºF) for chilled foods (Fuller *et al*. ,1985). Small kitchens may have just one cold room for all chilled food storage together with a frozen food cabinet. Larger establishments required separate chill storage for raw meat, raw fish, and high risk products (dairy and cooked meats). The advantage of this is that, in addition to reducing the risk of cross – contamination, ideal storage temperatures and humidity's can be provided to suit each merchandise. The choice between reach – in and walk – in refrigeration should be based on storage capacity (Fuller and Kirk, 1991).

Additional storage areas should be provided for a number of other materials. Most kitchens normally carry a wide range of detergents and cleaning materials, which must be stored away from food materials. Storage is also required for all items of crockery, tableware and cutlery and for serving dishes and so on. These are normally stored close to both the dish– wash area and the service and restaurant areas (Fuller and Kirk, 1991).

E. Preparation areas : the requirements of vegetable preparation area depend upon the volume of vegetables and salads served and on the nature of the purchased goods (Fuller and Kirk, 1991). A sink and a table should be sufficient for preparation, the work center may incorporate a waste disposal machine, or some way of

handling waste and trimmings, this may be a bin. Preparation of fish, meat and poultry in most hotel kitchens have butchery department which can handle large quantity of goods such as half a carcass. Nevertheless, in smaller kitchens most types of meat, fish and poultry required is purchased in portion– controlled cuts and ready–to–cook forms in order to reduce preparation time and space. As a minimum, a sink and preparation table is required. The vegetable, fish, meats and poultry preparation area should be located close to respective cooking equipment and space.

F. Production areas : is the heart of the kitchen, and all the other areas are meant to support it. Production areas can be divided into two sections, which are the hot line and the pantry areas. On the hot line, an analysis of the menu should reveal the type and capacity of cooking equipment required in order to determine placement of equipment based on the cooking methods to be used. There are two major ways to cook food: dry heat methods and moist heat methods. Moreover, menu analysis should provide information on requirements for each of the cooking methods, both the average and peak production requirement (kg /hour or liters / hour). In making decisions about the numbers of appliances to be used, multiple activity should be constructed to determine if there is any possibility of sharing equipment among menu items for instance, the ranges were fully used around 9:15 – 9:45 a.m., fryers at 9:00 – 9:45 a.m. and steamers at 10:45 – 12:00 a.m. (Fuller and Kirk,1991). A kitchen that is well laid out always set large volume equipment at the back and smaller ones which are used in cooking to orders at the front. In large volume food production, deck ovens, steam jacketed kettles, and tilting braising pans are normally found . In smaller (batch or a' la carte) kitchens, fryers, broilers, open burner ranges, and steam equipment are grouped together. In kitchens that require both volumes of cooking (large and small batches), the large volume, slower cooking equipment is placed behind a half wall under an exhaust hood. On the other side, or next to the wall, is the equipment used for smaller volume or quick cooking dishes. All heat and moisture producing equipment and surface cooking equipment should be located under ventilating hoods and the automatic fire extinguishing (sprinkler) system should be easily reachable (Katsigris and Thomas, 1999).

The pantry is where cold foods are prepared for serving, the preparation responsibilities include salads, sandwiches, cold appetizers entrees, and desserts. Sometimes, it is referred to as the “cold kitchen” . A two compartment sink is a must for this area and work tables with cutting boards should be adjacent to sink. Refrigeration is also necessary, since cold storage is required for many ingredients, as well as a holding area for prepared foods. In banquet or other high volume foodservice operations, a walk–in refrigerator may be more appropriate. In addition, when the pantry is also the site of dessert preparation, additional refrigeration and counter space are needed.

G. Washing areas : utensil and dish washing areas are of vital importance in the maintenance of high hygienic standards for kitchen utensils and restaurant equipment. The design of a dishwasher area depends upon the number of crockery and cutlery items to be washed within a period of time. It should be big enough to deal with peak loads of all the different items and deliver them spotlessly clean, dry, smear free, sparkling and sterile (Fuller *et al*., 1985). There must be space to accommodate trolleys, spring-loaded crockery dispensing units, burnishing machines, waste disposal units and sinks (Cracknell *et al*., 2000).

H. Lighting : artificial lighting is almost invariably required for many kitchens, which are in basements or semi – basements and, in any case, may not be sited to obtain the best natural light. Adequate lighting is necessary for kitchen activities. Kitchen and servery lighting is important not only to support efficient operation, but also to promote proper sanitation (Fuller and Kirk, 1991). Not only is the intensity of lighting important, but also the direction of the light (to prevent glare and shadows) and the color of the light (to prevent distortion of food colors). Recommended lighting levels are 540 lux for inspection, 220 lux for work rooms and 110 lux in other areas (Fuller and Kirk, 1991).

I. Ceilings : treated kitchen ceilings, that inhibit moisture condensation should be installed. A floor to ceiling height of not less than 3 meters (10 feet) can give

workers a psychological lift and also aid in lighting (Fuller, *et al*., 1985; Fuller and Kirk, 1991).

J. Walls : kitchen walls should be heat -resistant, crack–resistant, easy to clean, attractive and hygienic–looking and able to reflect light (Fuller and Kirk, 1991; Cracknell *et al*., 2000). Many wall surfaces such as plastics and washable paints (preferable fungi resistance) give good results in kitchens. However, wall tiling (with either low – gloss or high gloss finish) which seemed to be more appropriate in terms of keeping clean should be used up to a height of 1.5 to 1.8 meters (5 – 6 feet) above the floor. Above the tiling, sound absorption and anticondensation materials are advisable. Where cost is a factor, such special protection may have to be limited to sink and stove areas (Fuller *et al*., 1985).

K. Food preparation surfaces : preparation tables topped with stainless steel, laminated plastic, or some other impervious material are easy to clean, and thus hygienic. Table and work surfaces must be sufficiently high for everyone or set proportionally the average height of workers. The best solution is an adjustable table with screw–out legs. The table heights which will suit most people are as follows : for light work, average work table heights are 925 to 975 millimeters (37 to 39 inches) for women and 975 to 1,000 millimeters (39 to 41inches) for men ; for heavy work, a height of about 900 millimeters (36 inches) is good (Fuller, *et al.*,1985). Most people can reach about 370 to 500 millimeters (141/2 to 20 inches) without stretching, thus the width of the worktable should be between 700 and 750 millimeters (24 to 30 inches). About 1.2 to 1.8 meters (4 to 6 feet) of table length is adequate for one person and 2.4 to 3 meters (8 to 10 feet) suffices for two people working side by side (Fuller *et al*., 1985).

L. Water supplies : Fuller and Kirk (1991) defined following types of water supply that are required in a kitchen :

1. Cold, non – drinking water for staff / cloak rooms, toilets, showers,

wash–up areas, utensil wash, bains–marie, hand wash basins and the hot water system.

2. Cold drinking water (mains water) for water fountains, food preparation and cooking areas.

3. Hot water, at various temperatures produced by a central boiler, possibly with a number of local calorifiers at different temperatures for hand washbasins and preparation sinks.

Main water must be piped directly to each item of equipment that requires a supply, as well as to the wash basins.

M. Drainage : floor drains are useful in wet cooking areas and for floor washing. Thus the floor should be sloped to take water to floor drains. Drainage can be provided to mobile equipment, using a tun dish or screw–in sockets mounted in the floor. Kitchen drains are often fitted with grease tap, which will retain fats and other solid material. These are normally located outside the kitchen and should be easily accessible for maintenance (Fuller and Kirk,1991).

N. Gas and electricity supplies : the gas supply should be controlled by a central switch so that the supply can be cut off if necessary or in emergency. The electricity must also be governed by a main supply switch (Cracknell *et al*., 2000). The devices used in both systems should be regularly checked by engineers.

O. Ventilation : the efficiency and productivity of the kitchen staff may be hampered or enhanced by the kitchen ‘s level of heating and ventilation. Kitchen ventilation must be sufficient to maintain comfortable working conditions, prevent condensation and take strong cooking smells out of the kitchen (Fuller, *et al*.,1985; Cracknell *et al*., 2000).

P. Color : the color of walls, ceilings and floors can aid working efficiency and cleanliness, by increasing light reflection, and can influent staff moods, by providing an encouraging and pleasant workplace (Fuller *et al*.,1985). However, colors which have a high reflective value (pale or pastel colors) should be used rather than strong or dark colors (Fuller and Kirk, 1991).

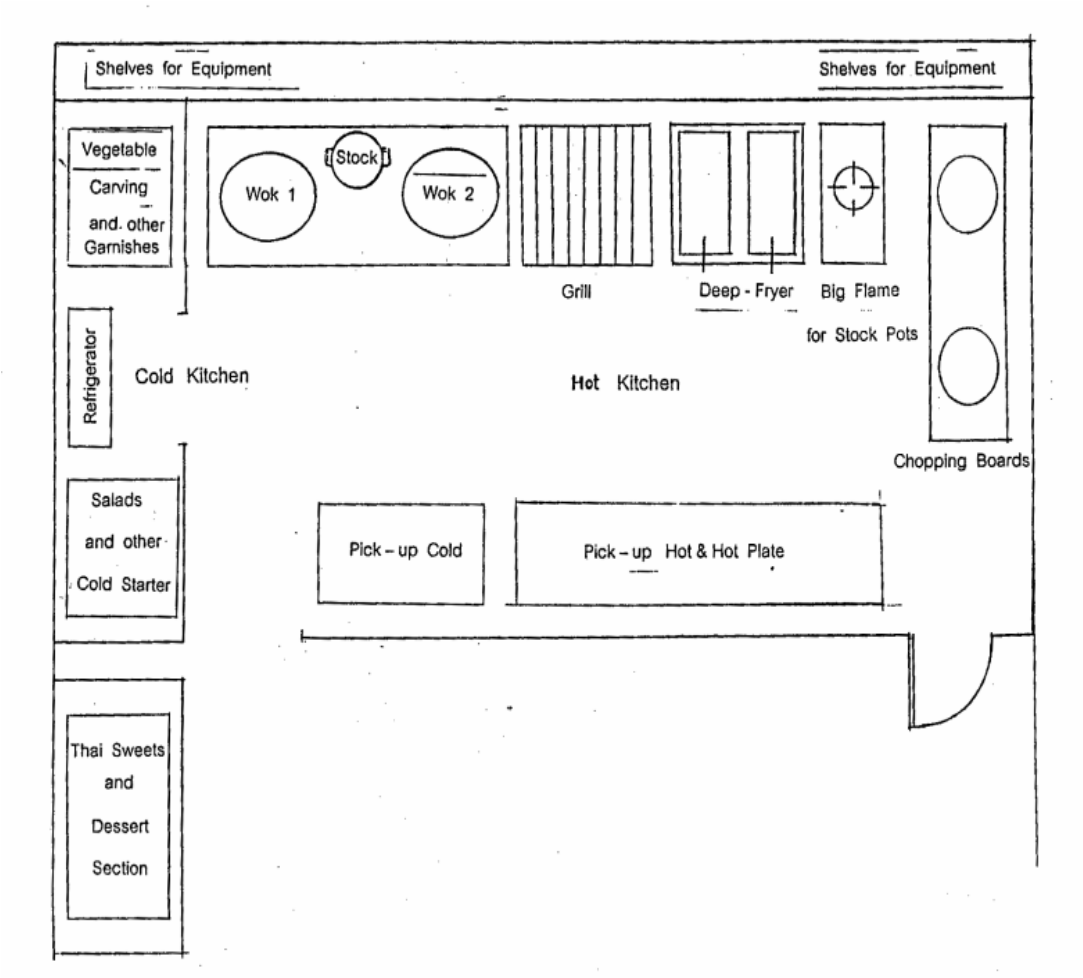

Figure 3 Plan of Thai kitchen

Source: Dusit Thani College (n.d.)

X. Organizational structure of Thai kitchen

Assigning people into the right place so they can perform the right job is called "setting up an organization". And proper arrangement of people in appropriate jobs designed will accomplish the goals of the operation (Knight and Kotschevar, 1989) .

Levels of responsibility in Thai kitchen (Dusit Thani College, n.d.)

Thai chef : (head chef so called chef de cuisine in European kitchen) is responsible for all kitchens staff and food productions.

Assistant chef : (Sous chef) replaces the chef in his absence and otherwise assists in operating the kitchen.

Wok 1 : (Chef de partie) instructs wok 2 and kitchen helpers to prepares, fry and sauté all food items.

Wok 2 : (Demi chef) second to Wok 1.

Curry chef : (Chef de partie) prepares solely all Thai curries and condiments.

Chopper : mainly prepared raw materials by ways of chopping, mincing and grinding.

Vegetable carver : this is a profession in itself which includes carving vegetables and fruits as well as other garnishing items.

Salad chef : (Cold-larder chef) prepares all cold salads, vegetables to go with condiments and cold sauces; often combined with vegetable carver.

In addition, even though rice is the most important component in Thai meals. Cooking the rice can be done by either Curry chef, Wok 1, Wok 2 or other workers.

XI. Thai food (Na Songkla, 1989; Rojanapaiboon, 2004)

Types of Thai food defined by ingredients and cooking methods. Thai food is divided into six categories.

A. Curry and Tom : the fresh ingredients were added to boiling water or boiling coconut milk until the ingredients are cooked then seasoned to taste. It is categorized into two kinds.

1. Curry (Kang) : the ingredients comprised of meat (pork, chicken, beef, sea foods etc.), vegetables. The name of curry is called by the kind of curry paste and meat that are used. Each curry has unique flavor of spices and herbs in the curry paste. Curry is further divided into two kinds:

a) Coconut Milk Curry (Kang Krati): which coconut milk is the main ingredient. Different curry paste made from different varieties and amount of fresh or dried chilies, spices, herbs etc. further designate the different kinds of the curry, which are : Red Curry (Kang Dang), Green Curry (Kang Keaw), Kang Kua, Kang Mussaman, Kang Panang, Kang Chuchee and Kang Kari.

b) Non – Coconut Milk Curry : A curry which is made by adding curry paste, met and vegetables to boiling water or stock made from chicken, shrimp or fish. There are 3 kinds of curry which differ by the curry paste used, namely Kang Pa, Kang Som (Sour Curry) and Kang Leang.

2. Tom : is a soup with added spices and herbs to enhance the flavor. Name of each Tom depends on the liquid, vegetables and meat added. Tom is also divided into two kinds: coconut milk soup (Tom Krati) and non–coconut milk soup.

B. Stir–Frying : is made by stir-frying ingredients and seasonings in small amount of heated cooking oil. Stir-frying is categorized by ingredients and tastes into five kinds : fresh vegetable stir–frying (Pud Fi Dang), stir – fried fresh vegetable with

meat, meat stir–frying, spicy stir–frying and fried–rice or fried–noodles (a one dish meal).

C. Spicy and Sour Salad : a mixture of cooked or partially cooked meat, vegetables, herbs, chilies, lime juice, with or without coconut cream and seasoned to taste, normally spicy hot. Three different kinds of the salad includes : Yum, Pla and Lab.

D. Dipping Sauce (Khruang Jim) : food which is dry or semi-dry, with different flavors, colors depend on raw materials and seasonings used. The accompaniment with dipping sauce are raw, soft-boiled, fried, charcoal-grilled, and pickled vegetables. Khruang Jim is divided into three kinds : chili paste (Namprik), coconut cream sauce (Lon) and other chili pastes

E. One Dish Meal : as offered in fast food restaurants or food venders. Fried rice, fried noodles, rice porridge and rice noodles with curry are presently popular.

F. Side Dishes : are served with hot food items namely curry and dippings. For example Fried-Mackerel with Chili Paste, Omelet with Sour Curry and Salted Egg with Mussamun Curry.