RELATIONSHIP BETWEEN PRODUCTIVITY AND CATERING TECHNOLOGY IN THE HOTEL AND CATERING INDUSTRY

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Abstract

RELATIONSHIP BETWEEN PRODUCTIVITY AND CATERING TECHNOLOGY IN THE HOTEL AND CATERING INDUSTRY.

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This research investigates the relationship between productivity and catering technology in relation to food production within the hotel and catering industry.

An extensive literature review was undertaken. This explored factors affecting productivity and effective application of catering technology, and identified themes which were subsequently further investigated during the programme of direct research.

The literature review was then set within the context of the contemporary industry via a programme of complementary empirical research. This included a series of case studies carried out in London, Birmingham, Redditch, Burton-upon-Trent and smaller studies in Sheffield. Case studies identified further relevant themes, which were then pursued via a series of semi-structured interviews together with an extensive questionnaire survey sent to hotels and hospital catering managers.

The research study demonstrated how productivity is clearly enhanced by effective use of technology. However, catering technology is often under utilised by practitioners, partly due to lack of training and knowledge of its benefits. Similarly potential gains in productivity are often not realised due to lack of management expertise.

The programme of research identifies several combinations of key themes, mechanisms and triggers which recur in high productivity systems. Lessons are

drawn regarding the successful introduction of catering technology and the associated improvements in productivity.

Productivity improvements as identified in the research can be quite dramatic and it is apparent that the hotel and catering industry has the capacity to further increase efficiency within food production. At the same time maintaining or improving the productivity of output, with the appropriate use of production staff, pre-prepared raw materials and correct layout and use of catering technology.

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Finally I wish to thank Helen Clark for her endurance in proof reading this document.

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The research investigates and evaluates the relationship between productivity and effective use of catering technology within hotel and hospital food production operations.

SECTION I

INTRODUCTION

1. INTRODUCTION

1.1 Introduction

Over the last twenty years the hotel and catering industry has progressed rapidly in terms of both increased food productivity and the introduction of catering technology. This has led to changing levels of staff requirements, new food production systems, and changes in layout. (For a fuller explanation of different systems see Appendix 3.) Due to these changes, existing guidelines on productivity and catering technology do not always reflect the diversity of current catering practice. This now covers a wide-ranging area, from the complex traditional "partie" system to a streamlined layout for cook-chill (enabling decoupling of food production and service). There have also been changes in raw materials with some establishments using pre-prepared or more processed food. The use of inappropriate guidelines, (Lawson 1978) leads to kitchens with more space and equipment than is necessary, and possibly reduces productivity. This research seeks to explore the relationship between catering technology and productivity using both qualitative and quantitative techniques.

Attempts have been made to view the selection of equipment and layout of catering kitchens as similar to that of a factory production line (Avery 1973) and to link this to computer based planning systems (Hales 1984). These attempts have failed for a number of reasons. Firstly, in many areas of catering the menu is not fixed. It varies, either on a regular cycle or depending on commodity price and seasonal factors: this makes any attempt at production layout optimisation difficult. Secondly, much of catering production is still craft based and individual chefs have a marked preference for particular types of equipment and layouts. In many catering establishments a determined effort is still made to operate from a standpoint of self-sufficiency and independence. Every product is made on the premises. However, with today's skilled labour shortages and high labour costs, ways of doing this cost effectively have to be considered. In the kitchens there is often a traditional pride in craftsmanship.

As Medlik states (1973) "At its best this promotes quality-consciousness at its worst it is concerned with preserving the status-quo."

Effective use of technological equipment is not possible without the co-operation of staff and the understanding by management that full utilisation of labour is needed to increase productivity. This process will be most expediently achieved through training and communication (Pope 1973)

Education is also partly at fault in preserving this status-quo. By not training kitchen staff to use the new technologies (DES 1986) it supports inertia. This is not to argue for change for change's sake. Other studies in this field (Pine 1987) have looked at technological change within the Hotel and Catering industry and have warned of the danger of looking for a 'technological fix' in what is a service industry. Technology must not impair the 'human contact' part of the service operation and this principle dictates where and when technology can be used (Nevett 1985).

It would seem, therefore, that there is a need for further research into productivity and use of catering technology, in order to obtain the optimum condition for both staff and management, whilst maintaining the necessary level of customer service.

SECTION 2

METHODOLOGY

2. METHODOLOGY

2.1 Introduction

This project is an exploratory study, not designed to investigate one specific 'problem' in depth, but to research issues around real world complex situations. It is not examining a single manifestation which can be reduced to a narrowly defined experiment.

The nature of the study has influenced the methodology chosen to undertake the research. This section summarises the method of research, providing insight into how the data contained in this study has been derived.

The overall objectives for the research are as follows:

- To identify areas within Hotel and Catering food production where catering technology is used and whether it improves productivity.
- To establish if there is a need for the industry to consider and expand technological operations.
- To substantiate the findings of earlier research studies within the area of productivity and catering technology.
- To extend knowledge within the Hotel and Hospital catering sectors and to obtain up to date data.

The research was to be divided into two sections - desk research and field research. Consequently it needed a research framework that would enable a broad investigation to be carried out, allowing subsequent identification and further investigation of specific areas of interest which arose. At a broad level, a general systems approach has been used.

The hotel and catering industry encompasses many systems within its infrastructure, and a general systems theory encourages the identifications of interrelationships between hard and soft systems and analysis of input, transformations and outputs.

For example, it is impossible for technological systems to function without other systems such as 'human activity systems'
(i.e. systems where employees are participating in activities that achieve some purpose). (Patching 1990)

According to Fuller and Kirk (1991) a systems approach can cover the following:

1 Systems concepts a method of describing and studying the parts of an organisation, and the way in which these parts interact to fulfil the objectives of the organisation.

2 Systems approach a method of problem-solving and a means of designing new systems.

3 Systems management a method of management which ensures that all parts of the organisation function in unison in order to achieve agreed aims. But all of these aspects have to be applied to the practical situation.

The general systems approach enables collection and analysis of material, but does not prejudge the results. Systems can be considered from both hard and soft respectives. Within the Hotel and Catering industry they interact with each other.

2.2 Systems Approach

Hard systems methodologies originated from coping with industrial post-war or military problems in which the initial formulation of the problem is relatively clear cut. The hard systems theory primarily from the physical sciences as applicable to mechanistic systems. Traditional management theories were primarily hard-system views concentrating only upon internal operations, most of the time and effort being spent on achieving economic solutions. The organisation was considered sufficiently independent so that its problems could be analysed in terms of internal structure, tasks, and the formal relationships typically found within bureaucratic work organisations.

This represents a hard systems approach to problem solving with objectives clearly understood and defined. With this approach, techniques such as work measurement were used to form and adapt work processes, so that machinery could be utilised more effectively. For example a catering operative would be observed, using a ganymede system, to assess speed and service techniques. As the procedure assessed had a tangible form (equipment) it could therefore be assumed that the problem is a 'hard' one and in many instances the solution could be associated with the design or layout of the machine or equipment.

However this approach overlooked that in many cases it was the human element which was at fault, Wilson (1984). The need arose for a methodology to solve 'soft' or human activity problems capable of finding optimal solutions in a real world situation.

Soft Systems Approach

A soft systems approach offers an approach which provides a framework to assist the analysis of human activity problems. Soft systems methodology (Beishon & Peters, 1981) also provides an approach which is appropriate for the study of complex situations and supplies a methodological structure which will ensure reasonably rigorous conduct of the investigation. This view recognises that the biological or social system is in a dynamic relationship with its environment and receives various inputs, transforms these inputs in some way and exports outputs.

(Transformation)

food (input) → production → service → food (output)

The receipt and transformation of inputs in the form of material, labour and information allows the soft system to affect the process of hard systems. Soft systems are not only related to their environment but also relate to themselves internally. Interactions between components affect the system as a whole. Essentially, this approach involves the application, to the rather unstructured world of human organisations, of a methodology based on systems theory as a means of structuring problems and highlighting important areas or substantive issues. In particular, it concentrates attention on the managers and users of a system, with their varying attitudes and perceptions. This forms the "appreciative system" that generates values and priorities and the 'weltanschaung' (world view) that structures the way individuals see things (Carter et al 1984). This approach also allows inclusion of the viewpoint of the researcher in evaluating its positive and negative aspects.

The elements of a 'soft' problem Wilson (1984) include such features as conflicting objectives, unclear or complex information flows, and people with differing perceptions and attitudes. Each person has a different set of values or 'weltanschaung' which affects the way they look at the world or operation. Systems methodologies provide a framework to investigate problems of this nature and are therefore more appropriate than purely mathematically - based or 'hard' methodologies to assess the intangible elements i.e. human aspects of the hotel and catering industry. Hard methodologies may, however be incorporated within the soft systems approach, to investigate particular themes, identified by the soft systems approach, but which lend themselves to analysis via 'harder' methodologies.

Rich Picture

The systems approach involves the initial construction of a rich picture of the subject area to be investigated. A two step approach has been used within this project: initially, a detailed analysis of library material was carried out. The literature is discussed in Section 3, where it has been considered within four main categories:

1. Productivity
2. Catering technology
3. Determination of kitchen equipment and planning
4. Organisational change

Further development of the rich picture consisted of a selection of case studies of traditional and cook-chill production systems. These hotel and catering operations are located in various parts of England. Units were chosen to form a representative selection of traditional working practices within the industry.

2.3 Case Studies

Within this ethnographic research, a series of semi-structured overt interviews were carried out in order to build up a complex "rich picture" in the form of case studies, of how and why changes have occurred in the use and development of catering technology within several organisations. Smircich (1983) considers there to be three main approaches to this task: observation; participation in the setting; and gathering reports from informants that use the operations concerned.

As a broad picture of the case study was required, a semi-structured interview technique was considered most appropriate, to allow the same subject areas to be discussed, but with the freedom to expand upon areas of particular interest. The primary level information was, therefore acquired from a series of interviews with key catering personnel at three four/five star Hotels and three large National Health hospitals (NHS) within the study areas for collecting relevant information. Secondary level information was acquired from the literature research, catering statistical data (where available) and books. The rationale for deciding upon a qualitative approach for this part of the study was principally concerned with identifying broad themes from the research affecting the effectiveness of catering technology and to identify issues which could then be investigated further in a survey.

Four and five star hotels were selected as it was understood that they would have a larger food production system, catering for more customers than smaller hotels. Large teaching hospitals were selected, again with the understanding that their food production would be on a larger scale and this would allow for ease of comparison.

According to Walker (1985) there are four main qualitative techniques; depth interviews, group interviews, participation observation and projective techniques. The depth interview was thought to be the most appropriate to develop the case studies. It enabled information to be obtained that was related to the experiences and attitudes of the informants towards changes caused by introducing/using catering technology. This offers, as Burgess (1982) suggests, "the opportunity for the researcher to probe deeply, to uncover new clues, to open up new dimensions of a problem and to secure vivid, accurate, inclusive accounts that are based on personal experience". It was decided that the most suitable format to pose the questions would be in a one-to-one interview, allowing the respondent to enlarge upon the answers and offer additional information. Identified subject areas which had emerged from the literature review were covered in each unit, to ensure the comparability of the case studies within the limits of this research. The semi-structured interview technique provides the freedom to follow up and develop particular issues as they arise within the different areas studied. Also a semi-structured interview was considered to be most responsive to the nature of the subject matter, since, as each organisation is unique, it would be difficult to devise a structure to incorporate all the variables. The major disadvantage is that the interviewer must be familiar with the situation and be alert to inconsistencies and omissions of data. The interviewer must also accept that, as an active participant in the information gathering process, his or her own 'weltanschaung' can shape the material which is elicited from interviewers. This should be avoided in so far as it is possible.

On the other hand, an advantage of this form of study (Nachmias and Nachmias 1978) is that, although main areas for discussion are predetermined, there is considerable freedom to expand items of particular interest. As cited by Hedges (1981), techniques which are traditionally termed qualitative are generally intended to determine "what things exist, rather than to determine how many such things there are".

Mann (1985) discusses the semi-structured informal interview as a technique for exploring social situations which are relatively under-researched. He outlines many disadvantages related to interview bias but concludes that this is a useful research technique if administered professionally and in a research situation of this kind.

2.4 Quantitative Analysis

Although the framework of the research is that of a soft systems methodology, some of the problem areas turned out to be quantifiable. In particular, estimates of equipment and human resourcing criteria are able to be quantified and are susceptible to optimisation techniques. These elements of hard system's methodologies are incorporated into the research. From the initial research, the literature review and case studies, it was decided that further information was required which necessitated field work to elicit statistical information. This complemented information already established from the case studies, and further defined the extent and type of catering technology used within the Hotel and Catering industry. A fuller rationale for the detailed survey design and content is provided within the Hospitals and Hotel survey section chapter 5 (5.3).

Questionnaires were developed to gain a better insight into the productivity of chefs and the types of production systems and equipment used. A vital skill in undertaking a questionnaire survey is the ability to structure, focus and phrase questions in a manner that is intelligible to respondents. Such questions also need to minimise bias, and provide data that can be statistically analysed (Gill and Johnson 1991). The quantitative information in the questionnaires was based on the issues raised in the interviews; it included a selection of dichotomous, direct answer, multiple answer, and open ranking questions designed to obtain the data required.

2.5 Summary

A broad systems approach has been used to provide a conceptual working framework. Research themes were identified based upon a thorough and wide ranging literature review. These themes formed the basis of a series of semi structured interviews which allowed further development of issues already identified and provided additional new insights within the case studies.

The questionnaire produced data which included an assessment of the potential value of a limited range of catering equipment in relation to productivity and the effects on staff.

Information has consequently been collected using desk research, semi-structured interviews and questionnaires. These were considered the most appropriate research methodologies for the nature of the project and the scale and depth of information required. Together they provided the opportunity to conduct and interpret empirical research based upon a sound grasp of existing findings and theory.

SECTION 3

LITERATURE REVIEW

3. LITERATURE REVIEW

3.0 Introduction

This section provides a review of key publications in the general area of productivity and catering technology. The literature has been considered from four perspectives which the review demonstrated as relevant to the project.

These are:-

3.1 Productivity

3.2 Catering Technology

3.3 Determination of kitchen equipment and layout

3.4 Organisational change

As far as possible, the literature is directly related to the Hotel and Catering Industry. However, appropriate 'generic' articles are also considered, since industry specific literature is limited and because work carried out from a different or wider perspective can be relevant. The first three sections are analysed in greater detail as they are specifically concerned with the research area. However, the literature also maintains that an understanding and awareness of organisational change is necessary because of the relationship between effective implementation of new technology and the climate of the organisation.

An extensive literature review was necessary to shape the direct research carried out as part of this project, (i.e. the case studies and questionnaires into the context of existing knowledge.

3.1 PRODUCTIVITY

3.1.1 Introduction to Productivity

Within manufacturing and service industries productivity is both a national and organisational issue. At national level, Government needs to establish favourable economic conditions to enable organisations to increase productivity. Within organisations, the traditional means of stimulating productivity has been through changes in working methods, often in a mechanical way (automation and computerisation). Techniques such as work study and organisation and methods (O.M.) are also used to examine ways of working, and to bring about changes that typically result in lower costs.

There is a constant theme in the literature over many years of writers depicting the service sector as being a low productivity area when compared with other sectors of industry. For example Elfring (1989) and Dilworth (1989) agree that productivity improvements outside of manufacturing industry have been less spectacular. However this view may now be obsolete as some areas of the service sector (for example banks and insurance companies) are now using computers and technology to dramatically improve productivity.

In the hotel and catering industry (part of the service sector), productivity is also essential for growth and profitability. However certain factors in this labour-intensive industry need to be considered differently from the manufacturing sector. In hotel and catering, Human resource is a key factor in determining productivity, but it also has a very important role in influencing the nature of the customer experience. Pursuing productivity per se without considering customer impact can be self defeating. Labour costs may be reduced but, if customer satisfaction also diminishes, there may actually be a detrimental effect on productivity due to longer term loss of revenue.

Within the generic literature review it has been found that a predominant amount of literature concerns how the **employee** can be productive. This has been investigated and defined rigorously as it identifies the working combination of employee/catering technology as a key issue in achieving productivity.

3.1.2 Defining and Measuring Productivity

Dilworth (1989) has defined productivity as the ratio of all outputs over all inputs. Whilst this may be useful as a general approach, different authors have attempted to be more specific by depicting this relationship numerically or by formulae. Productivity has also been defined by Greenberg and Ross (1978) as a measurement of production, with the ratio of output to input as the numerical measurement. According to Rose (1980) productivity is the measurement of resources that are needed to produce an identified output. Outputs can also be assessed as partial measures of productivity along the continuum between the input of resources and the output of resulting goods and services. Resource inputs include labour, which according to American productivity convention would include all aspects of labour, (both direct and indirect). Labour inputs can be reduced, for example by decreasing the amount of time required to produce menu items (the outputs), this would increase productivity. One of the most common productivity measures is meals per productive work hour. However Brown and Hoover (1990) dispute the use of such measures by pointing out that in many food service operations, there is no quantitative basis for determining the time required to produce and to serve a specific menu item by a trained employee working at a normal pace. Nevertheless it is surely possible to compute total labour hours and compare these with total production.

As with all statistics, the basis of measurement needs to be selected with care (Hopwood 1974). Possibly the area for discussion is better explained by Jones (1990) who defines productivity as the difference between inputs and outputs. "Inputs" refer to the resources used in making a product and providing a service;

whilst "output" is the product or service itself. Whilst demonstrably true, this can lead to difficulties for those seeking to depict this relationship quantitatively. Within the hotel and catering industry it is difficult to measure and calculate "inputs" entailing an assessment of the intangible services, (e.g. the chefs' creativity and restaurant ambience), and their effect on customers in order to generate the "output" of the meals served. This illustrates that further difficulties arise when attempts are made to include productivity factors which are not readily expressed in quantitative financial terms. Productively measures often avoid this dilemma by including only those elements of productivity which can be measured quantitatively.

Figure 3.1.1 Productivity Measured Quantitatively

Examples of	inputs ⇓ labour money materials energy	and	outputs ⇓ goods, products services (often measured financially)

(Adapted from: Heap 1992)

The problem of 'low' productivity and how to deal with it is a constant theme in the literature. According to Kotschevar (1968), the productivity of a worker in the foodservice industry was at that time (1968) low compared with other industries. He maintained this may have been caused by employing low-cost semi-skilled and untrained labour who were not capable of achieving higher productivity. This view is still relevant today as many catering sectors depend on casual, low paid, untrained labour to fill in for absent employees or unfilled vacancies.

The problem of obtaining higher productivity from the labour supply is not an easy one to solve (Brendel et al 1985). A possible solution to this in the food production/service industry would be to change production methods so that meals can be produced in mass quantities. Then it is possible to take advantage of machine bulk technological production, to increase output. However Mill (1989) disputes this, maintaining "that little substitution of technology for people can occur without losing the whole meaning of the terms hospitality and service".

Johns and Wheeler (1991) adopt a financial basis to measure productivity within the UK catering industry as:

<u>**Figure 3.1.2**</u> <u>**Measuring Financial Productivity**</u>

PRODUCTIVITY = SALES REVENUE = OUTPUT

INPUTS = LABOUR + OVERHEADS + MATERIALS + ENERGY

LABOUR ⇓ (DIRECT) COSTS

OVERHEADS ⇓ (INDIRECT LABOUR) COSTS

Source: Johns and Wheeler (1991)

This can be compared with an American formula (Adam & Ebert 1986) which breaks down total costs into labour, capital, materials and energy. Johns and Wheeler (op cit) break costs down further and include: direct labour costs (e.g. production/food service staff) plus indirect costs (including administration and marketing employees) into overheads. Here there is also a potential problem in that the inclusion of indirect costs are perhaps outside the responsibility sphere of the catering manager and can distort productivity figures. Alternatively a broadly based ratio could be used to define productivity. This would attempt to incorporate the intangible aspects of the industry (e.g. social skills) referred to by Heap (1992). See Figure 3.1.3. Productivity here is defined as the ratio of output to input, but has included the value of the human resource element.

Figure 3.1.3 Measuring Financial and Service Aspects of Productivity

	Narrow Quantitative Measure		Wider Quantitative and Qualitative Measure
Productivity =	$\frac{\text{Outputs Sales}}{\text{Inputs (Costs)}}$	or	$\frac{\text{Value of Goods/Services Provided}}{\text{Value of Resources Consumed}}$

Source: Heap (1992)

Productivity measures are useful when comparing similar organisations or restaurants to assess whether they are productive. Productivity can also be measured at different levels of the organisation for example different operational units, even down to individual employees and specific time periods. "Overall productivity of the organisation is dependent on the productivity of each division or department", for example, kitchens, restaurants, coffee shops, (Heap, 1992). This idea is important in that it identifies that there are often a number of different areas contributing inputs associated with any output. It would seem productivity can and should be increased by a total team effort involving all functions and personnel within an organisation.

The importance of measuring productivity is referred to by Drucker (1973) who states that productivity objectives are essential to give a business direction and that without productivity measurement there is no control. It is clear that the hotel and catering industry may have lagged behind in its productivity techniques, but the pressures for improving productivity are as great in this industry as in others.

3.1.3 Managing Productivity

A particular feature of the catering industry is that it must often deal with the conversion of perishable raw materials into finished products. These finished products are subject to fluctuating demand and are often themselves perishable. This can substantially affect the cost of raw materials relative to sales, since if forecast sales do not materialise, the relative cost of raw materials will be higher. This is an important factor, not widely reflected in literature.

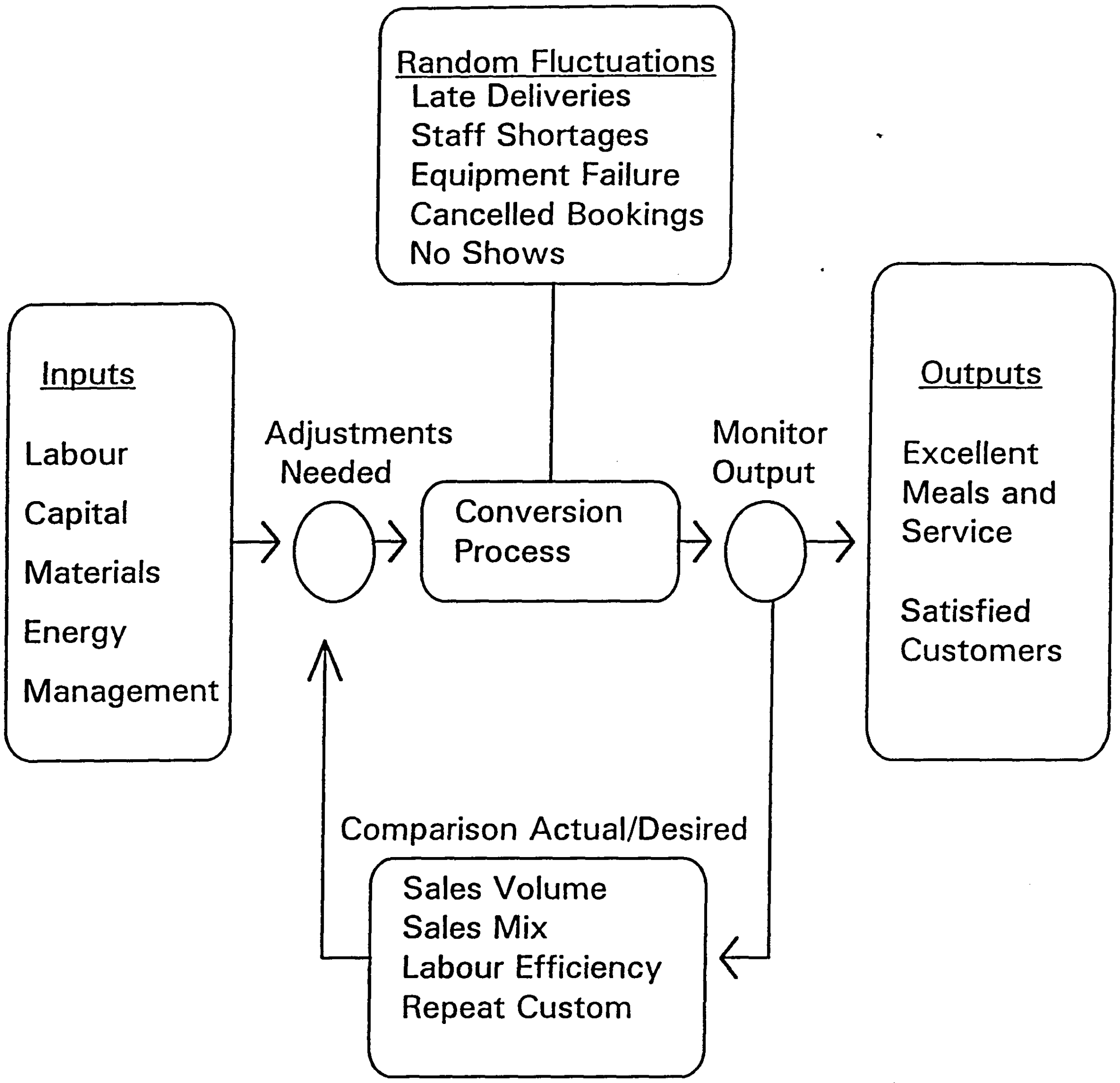
However some writers do confirm that for a long time the industry has operated under a rather inefficient marketing system in which production, merchandising and service take place under one roof. The food service industry often still produces goods upon demand. The industry, moreover, is widely spread throughout the country, not concentrated in one geographical area. Raw food products must be delivered to widely dispersed units, which each do relatively small volume of business (Kotschevar op. cit). Gullen, Hoover and Moore (1978) confirm that food perishability is a crucial factor when predicting demand, especially in conventional systems, in which there is no provision for storage, or holding of the finished product beyond current demand levels. Ruf and Donaldson (1975) also maintain that overproduction and underproduction result in substantial cost increases which affect food quality and influence customer satisfaction.

Despite the importance of sales forecasting, in my experience many mangers are not competent in this area. Possibly the 'hands on' form of management that is found within the hotel and catering industry reflects the problem of progression from an operative to manager without the statistical, financial or budgetary control knowledge and measurement techniques necessary to achieve high productivity levels.

According to Guerrier and Lockwood (1988) referred to by Witt and Witt (1989) "traditionally the development of hotel managers encourages a "being there" style and discourages reflection and planning... Their 'hands on' bias may make them reluctant to spend time on and even afraid of, paperwork and figurework". Forecasting is therefore an important activity. The most frequently used techniques include use of past records and intuitive estimates which are variations of the naive model. This traditional method of assessing demand arguably tends to lead to over-ordering and over-production which in turn reduces profit. Without correct production records, and if left to a naive model 'gut feeling' this can also lead to estimating a need for more staff than required. In total output this would increase overall costs. In a study by Miller and Skanklin (1988) and Repko and Miller (1990) forecasting, production and service records were maintained by the majority of the participants, but the results of their study indicate that computers and mathematical studies are not widely used for this purpose. This reflects the need for better training and organisational change needed within the industry to achieve better productivity.

A problem with forecasting within the hotel and catering industry is that business is often unpredictable, unlike some manufacturing or service industries. For example five functions could be booked for June 1992 but none for June 1993, and other social events such as for example the World Olympics could affect business. Even with more sophisticated forecasting techniques, there undoubtedly remains a potential problem in the extent of random fluctuations affecting the food production and service system, see figure 3.1.4.

Figure 3.1.4 Conversion Process for Food Production and Service

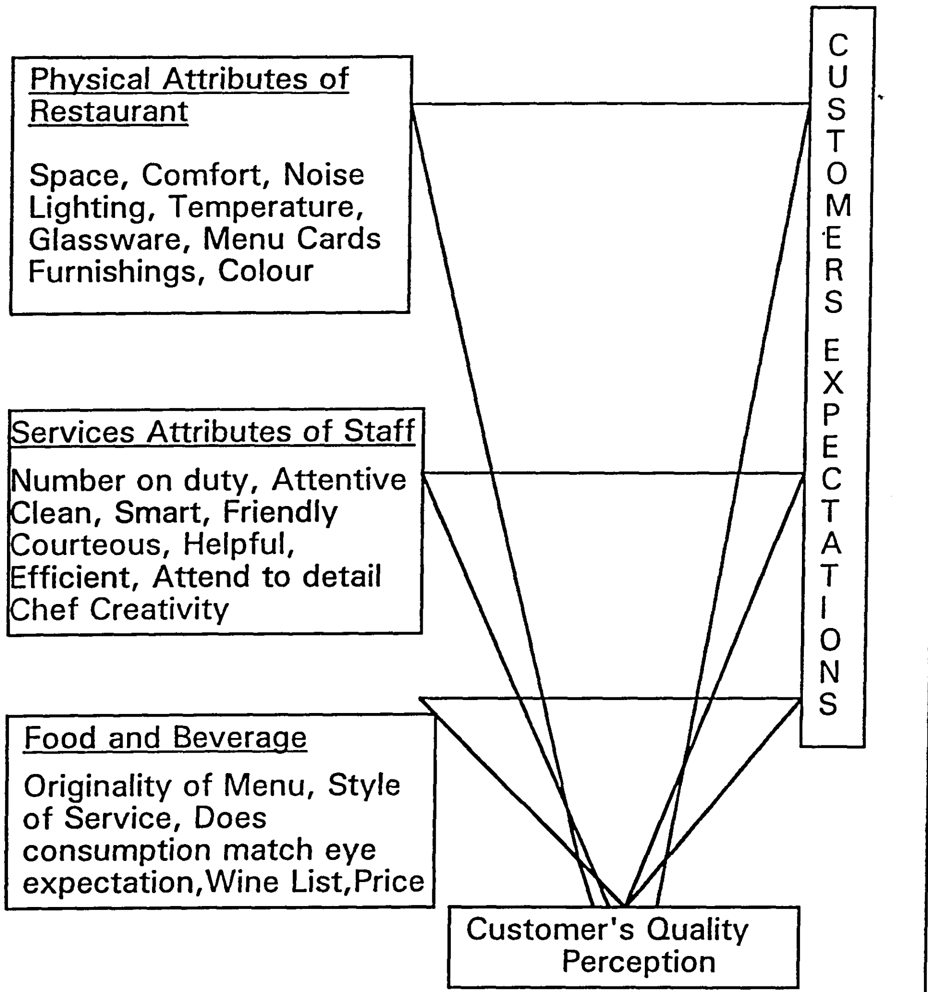


(Feedback)

(Source adapted from Adam and Ebert, 1986)

Random fluctuations refer to the unplanned or uncontrollable influences that cause actuál output to differ from planned output. Within a food production operation this could be caused by late deliveries of food, staff shortages, and equipment breakdowns. These could affect both the menu output and customer satisfaction. It is therefore necessary for management to receive feedback to assess whether the required productivity and quality control are being achieved. This also emphasis the difficulties in assessing the intangible elements (figure 3.1.5) of production and service and how difficult it may be to optimise on productivity within the hotel and catering industry.

Figure 3.1.5 Intangible Aspect of Services



Source, Jones 1983

It is apparent from the diagram that employees within the hotel and catering industry are producing goods that are purchased and consumed almost immediately. The "outputs" are assessed not only by their quality but also by ambience created by atmosphere and skill. In addition the consumer enjoys a wide variety of choice of outlets in which to participate.

According to Heap (op.cit.) productivity can be improved by:

1. improved production/service techniques to increase output through improved performance, reliability or aesthetic appearance.
2. improved staff skills and training to reduce production and service costs.

3. increased levels of staff participation and involvement with better management communication skills to help improve the quality of staff performance.

This however ignores obvious additional steps such as reducing the price of inputs and maximising the value of outputs through measures which can include qualitative aspect of productivity management. However, Heap is surely correct in that successful management of productivity does involve an integrated holistic approach to its different dimensions.

3.1.4 Productivity and the Human Resource

A. Measuring the Human Resource

The key role of the human resource in the hotel and catering industry implies that productivity measures should certainly include this factor. Therefore within many hotels and catering units great pressure is put on managers to increase the productive use of employees, (e.g. one restaurant waiter/ess to 10 tables). Research carried out by Ball, Johnson and Slattery (1986) refers to productivity measures carried out in coffee shops, as shown in figure 3.1.6

Figure 3.1.6 Productivity Measures in Coffee Shops

Hotel IV Coffee Shop May 1993

$$\text{F.T.E.E.*} = \frac{\text{Total hours worked for the month by coffee shop staff}}{\text{Number of working hours per day} \times \text{The total working days for the month}} = \frac{2601}{8 \times 22}$$

$$= \underline{14.8}$$ * (FTEE = Full time equivalent employees)

Source: Ball, Johnson and Slattery (1986)

Thus, the standardised labour input to the coffee shop for May 1993 is equivalent to 14.8 Members of full-time staff. The figure of 14.8 members of staff can only be useful when compared with other coffee shops or over a period of time within the same coffee shop in relation to levels of sales achieved. Generation of staffing standards based upon such measures enables managers to assess the number of staff needed on a daily basis and possibly employ part-time staff only for peak periods, thus reducing labour costs and increasing productivity.

Output per labour hour, often called labour efficiency, is possibly the most common partial measure of productivity. Adam and Ebert (1986), and McFarland (1975) Heap (1992) also confirm that the most frequently utilised measure of labour time is meals served per labour hour or per person. For example, within hospital kitchens output per labour hour is used as a management assessment of staff productivity. In the case of hospital catering for 1,000 patients per day, hours are usually calculated on a eight hour shift for kitchen staff. In a situation where eight chefs cover the eight hour shift, average labour productivity could be expressed as shown in figure 3.1.7

Figure 3.1.7 Average Labour Productivity in a Hospital Kitchen

$$\text{Labour productivity} = \frac{\text{OUTPUT}}{\text{LABOUR INPUT}} = \frac{\text{1,000 PATIENT MEALS}}{\text{8 staff x 8 hour shift}}$$

$$= \text{15.63 patients meals/labour hour}$$

(Adapted from Adam & Ebert 3rd Edition 1986)

Therefore labour productivity can be calculated on a basis which can also be used to assess required staffing levels within hospital catering once standards have been agreed. This average figure could possibly be enhanced by looking towards improved productivity with the use of catering technology.

It seems there is a lack of up-to-date literature on modern food service revenue recording technology to obtain productivity information. The majority of public or commercial organisations now use various technological methods for recording revenue and relating it to service staff performance. Analysis of modern tills can give a reliable breakdown of overall volume of sales per employee, or figures corresponding to menu group or item sales. These figures can then be used as performance criteria for different outlets within the organisation.

Matthews (1975) discusses improvements in hospital catering productivity which can occur through the optimal utilisation of all available resources: human - direct and indirect labour, facility - space and equipment, materials - food and supplies; and operational - time and money. At this time, hospital catering was predominantly labour intensive and manpower - direct and indirect - was a key resource affecting productivity. However with remarkable foresight Matthews predicted that hospital food service systems would become more technology intensive and that changes in job content through automation and/or substitution would increase dramatically.

The importance of staff involvement and understanding of productivity issues is essential. This will usually involve training. Jones (1988) considers that "productivity can be improved by reducing labour, but with the danger of reducing quality; quality can be improved by higher staffing levels, but at the expense of lower productivity". It would seem in some sectors of the service industry this effect is not always evident as both productivity and quality have improved. e.g. bank automatic cash tills. In the catering industry low levels of productivity can often result in slack attitudes and poor quality of performance from the chef.

B. Factors Affecting Human Resource Productivity

Reasons for poor productivity within the hotel and catering industry are subject to widely conflicting opinions. However, one constantly recurring theme has been to do with skilled labour shortage, labour turnover, and demand for increased wages. Traditionally the result of this has been high levels of staff turnover, although with the present recession employee turnover is not as rapid as has been identified in previous years.

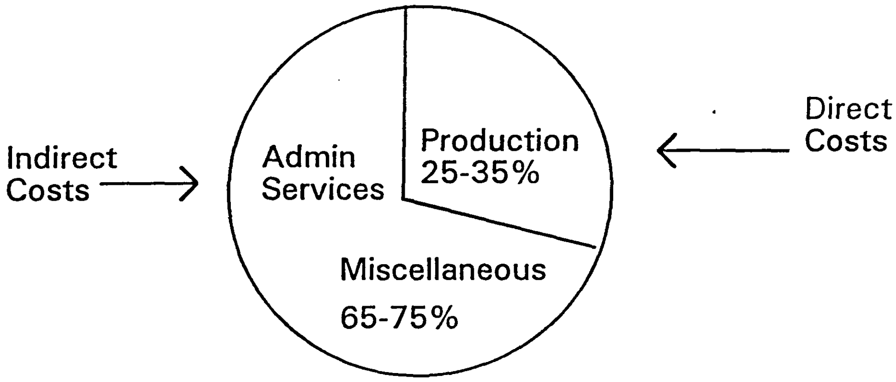
Bellas (1982) suggested that the methods used to gather information to assess productivity had at that time been derived from manufacturing industies together with the use of industrial engineering techniques, such as work sampling and time and motion studies. While these techniques have contributed to an understanding of productivity within the food production and service industry, their applications has been narrow in focus and has failed to include the role of the customer and other intangible elements associated with production and food service.

In its broadest sense, productivity refers to the efficient and effective utilisation of resources, people, machines and money. As referred to by Pope (1971) one possible solution is increased productivity based on full utilisation of staff, equipment and resources for production and service of foods. As has already been pointed out, optimum use of these resources is necessary for the organisation to grow and prosper.

One of the factors that may lower productivity in the industry could be overstaffing within the food and beverage areas. Freshwater and Bragg (1975), state that inadequate determination of optimum labour requirements and of acceptable levels of performance contributes significantly to the financial collapse of many food service establishments.

It would seem that anyone dealing with the food service industry should recognise that labour cost will always be much more crucial than in other industrial sectors. (See, example Hillier (1993) Norfolk and Norwich Hospital Catering Expenditure - £2136m. 63% labour costs, 30% food costs, 7% sundries). One method of reducing labour costs is through the use of convenience food which means purchasing goods with "built-in service". The two major cost factors in food production are raw materials (food) and labour; but it is assumed that the major part of the total labour cost is due to the labour involved in food production. This assumption is not always correct. See Figure 3.1.8 which illustrates that indirect labour can be the most important influence.

Figure 3.1.8 Breakdown of Restaurant Labour costs



Source: Skroder 1981

A decision which frequently must be made is whether the caterer should cook on the premises or buy semi- or fully prepared items. Skroder (op. cit) suggests that the lower the cost of the raw materials, the higher the degree of convenience that should be included, due to the fact that the cost of own labour will be a more significant factor in the case of an inexpensive product. For example vegetables, where preparation is very labour intensive should be purchased with a higher degree of convenience than fresh fish, which is more expensive. This view perhaps confuses the importance of percentage labour cost with actual labour costs. Whether extra labour is used for prepared vegetables or fish, it is the effect on total labour costs (not the percentage of labour cost to individual item food cost) which is important.

3.1.5 Productivity and Food Production and Service Systems

Traditional food production/service methods are labour intensive and require good skills in order to obtain high quality products. Cooking is a skilled craft, and a skilled chef has a high market value. This skilled labour is scarce, particularly in institutional food service where rates of pay are generally lower at this level than in hotels and restaurants. The production of food to meet a meal-time deadline has meant that food production has often remained unaltered and the many criticisms aimed at institutional food results from the necessity of producing freshly cooked food at set meal times. (Glew and Armstrong 1981).

The problem that many managers need to assess is what degree of technological change is strategically best for their operation. In large bulk production operations, a cook-chill system can be advantageous, for example in the case of hospitals and banqueting operations within hotels. In smaller scale traditional production systems, more modern equipment and relocation of present equipment can possibly suffice to increase productivity. Whichever productivity route is followed, long term prospects have to be considered for financial and resourcing purposes. With regard to large bulk operations, Kotschevar (1968) states that if the food service industry changes its traditional production systems so that food can be produced in mass quantities, it would then be possible to take advantage of 'machine' production. Synder (1983) and Brendel et al (1985) refer to the use of cook/rapid chill systems to increase productivity, with less money being spent on employees' salaries and staff hours, because fewer employees are required for production, compared to traditional systems. Also less equipment is used, therefore a reduction in capital costs can be achieved with less energy costs also being incurred.

Boltman (1975) (referred to by Glew and Armstrong 1981) also proposes the use of technology to improve human resource productivity. She estimates that a conventional production system requires one worker per 25-60 meals produced, depending upon the type of service offered, whereas one worker in an equivalent cook-freeze system can produce 100-140 meals. Even twenty years ago Zolber and Donaldson (1970) suggested that hospital food systems were faced with strategic demands not known a decade before - demands for increased production, quality service and maintenance of an optimal balance between labour and food costs.

It would seem that to increase productivity, today's hotel and catering industry must make the decision to incorporate catering technology into their production systems in order to achieve the still growing demand for increased food production. Demand for meals served by caterers in the UK has increased by 200 million a year since the mid 1980's to reach 9.1 billion in 1990 (Woolins, Market Power 1991). The quest for increased productivity is made more urgent by the extent of change that is underway throughout all sectors of the industry. According to the Market Power research, the commercial sector of the catering industry is becoming increasingly penetrated by chains, with one in five of all private sector outlets either owned by a group a franchise, or part of a consortium. Many 'chain' operations now use some form of catering technology to increase productivity and ensure quality control. Therefore with demand for more meals and problems associated with recruiting skilled staff, other production systems beside traditional techniques have to be considered by management to achieve increased productivity.

As labour, space and equipment costs are escalating, Jones (1990) states that catering companies who have changed their "operational strategy and/or process technology" have achieved a competitive edge compared with the traditional hotel and catering operations and no doubt have also increased their productivity. Whatever the volume of business, management needs to try and match production and service capacities with demand.

With reliable forecasting and with optimum demand, an operation is less likely to incur the additional labour costs that result from overstaffing during slack periods. Pickworth (1988) states that labour costs are highly perishable. Once employees report for work, they have to be paid regardless of the volume of business. Thus labour, unlike some leftover food cannot be stored for use the next day. (However some establishments do send the resource home!)

Other research by Johns and Wheeler (1991) draws a parallel between catering and other service industries since they note that "the retailing and banking industries improved their productivity performances as a matter of strategy during the past two decades. The implication is that a similar strategic emphasis is desirable within the hospitality industry". No doubt productivity within the hotel and catering industry will become a major concern within the next decade. It would seem that areas of service industry which have increased their productivity are involved with technological improvements. According to Jones (op. cit) "Unlike hotels, the food service sector has benefited from technological innovation, which has improved productivity".

3.1.6 Summary

The formal measurement and quantification of productivity within hotel and catering industries is still relatively undeveloped in the literature. Although there are various views on this subject, it would seem there is a way forward by using better production management control systems. Pickworth (1987) states that to some, productivity improvements can be a matter of time and motion studies or investing in labour-saving equipment. To others, it is more an issue of training, application of catering technology, monetary incentives, and management styles. (Witt and Witt 1989). Whichever method or system used, it has to be carefully evaluated by the management team, to assess the attributes of the staff involved, and to control the subtle relationship between quality and productivity. No matter how well designed the food production system, poorly trained or demoralised staff cannot achieve optimum productivity. Any catering production system depends on human behaviour to reach its maximum productivity. However when managed effectively it seems clear that technological advancement can be used to increase productivity without decreasing quality and affecting customer acceptability.

3.2. CATERING TECHNOLOGY

3.2.1 Introduction to Catering Technology

Traditionally hotel and hospital kitchens have been equipped to produce any menu dish on demand or to prepare food for a predetermined time. This has also required a substantial labour input, and has always created tension arising from the necessity of working to tight schedules under mounting pressure, and at the same time achieve a high standard of cuisine.

From this traditional production system new technology has evolved, but slowly, as the industry is craft dominated, and has been accustomed to provide its customers with individual attention. Traditionally, individual attention is equated with high personal service and low use of technology (high touch/low tech).

Where there has been clear demand for mass catering (for example fast food) new technological advances have been implemented to increase productivity and function economically, using for example automatic deep fat fryers. Within other sectors of the industry, catering technology has also been used to increase productivity by reducing material handling. Purpose-made automatic equipment such as dicing, shredding and mixing machines has been utilised. Additionally, large scale batch production can be achieved with better automatic control, using industrial sized catering equipment such as bratt pans. From these advances in catering equipment, other advanced production systems have been designed to produce or finish chilled or frozen foods in large quantities, either for the organisation's own use or for distribution to various catering outlets.

With this change from traditional production techniques a limited amount of deskilling of catering staff can occur particularly in the preparation and service of food. Standard recipes are often used to achieve cost formulas. These also give a more controlled environment for food preparation and production. The qualified/experienced chefs will still be retained, but fewer in number. In cookchill systems these will be located within a central production unit, prepared and cooked food being distributed to other units or banquet rooms for assembly and service.

Technological production systems can lead to enhanced productivity as menu items can be stored (buffer stock) in large quantities. Many new production systems that are producing meals used by the industry, e.g. cook-chill or sous-vide can only be produced with catering technology. To effect this move away from traditional production systems to de-coupling of production and service it is essential for chefs and catering staff to be informed and re-trained to create and utilise these new technological food production systems. Management needs to implement a new structure for this organisational change to flourish, otherwise staff revert to their old habits and only use the equipment and skills they are familiar with.

From the literature review it has become evident that within the hotel and catering industry, literature concerning technology refers mainly to fast food, cook-freeze, cook-chill and sous-vide: a very limited perspective. A wider view has been incorporated by including generic literature to draw comparisons.

3.2.2 What is Technology - Classification

Haywood (1990) states that most managers think of technology as machines and automated equipment. But he maintains that technology has a much broader meaning, and represents any systematic attempt to transform things coming into your organisation 'inputs' into things going out 'outputs'.

"Technology is all the things you do to produce your product and deliver your service." (Haywood op cit) This may seem too general to be helpful but does emphasise that technology is appropriate in all aspects of food production and service.

Possibly as outlined by Levitt (1976) the hotel and catering manager should think of technology in three forms:

A. "Hard technology" - which would represent machines and tools replacing human labour, e.g. food processors, mixing machines (simple technology).

B. "Soft technology" - examples would include carvery/salad bars enabling people to serve themselves. Also better organisation and layout of the unit helps to achieve improvements and turnover of customers (intermediate technology).

C. "Hybrid technology" - equipment combined with planned production systems, e.g. cook-chill/sous-vide, centralised production systems (advanced technology).

(Source adapted from T Levitt 1976)

Within the hotel and catering industry there is an ever-increasing demand for the employee to produce more, either by providing more meals or by serving more people. Production can be achieved, and historically has been, with minimal technological assistance but there comes a time when saturation point is reached, and the system cannot effectively increase productivity by its traditional methods of reliance on staff.

Possibly historical attitudes of the industry's importance as a "service" industry are a factor in maintaining these traditional methods. Levitt (1972) states "we think about service in humanistic terms, we think about manufacturing in technocratic terms". Manufacturing industries tend to assess the production problem and how it can be altered; in particular looking at organisational rearrangements, equipment, and skills required for using equipment.

In contrast, the service industries look for solutions in the "employee" by improving their skills and attitudes to the task concerned. It would seem "this humanistic conception of service diverts us from seeking alternatives to the use of people". (Levitt op.cit.)

Great productivity increases occurred in manufacturing and agriculture when machines were substituted for hand labour. It would seem, according to Glew and Armstrong (1981) within hospitals offering traditional production service, kitchen staff and the equipment used are not employed to their optimum productivity. This is due to the 'peak' of productivity reached before the meal service and then the 'trough' after service when staff are less productive. This results in catering equipment being operated for short periods only. This is not a cost-effective use of capital and labour, which are not being used to their full capacity and is the reason why decoupling of production and service is so attractive.

Another problem associated with traditional production systems within large institutions arises from the impossibility (Ross 1971) of producing all items from the raw state and all cooked simultaneously for bulk production and service to an acceptable quality standard. Food is usually prepared and cooked well in advance and held hot until required, possibly from 10.30am to be served at 12.30pm. Under these conditions it is very difficult to meet the present requirements of The Food Safety Act (1990) and also produce high quality food. Decoupling is potentially attractive for this reason also.

3.2.3 Technology and Productivity

Whitaker (1987) considers "some organisations react very conservatively by introducing technology in a cautious, piecemeal style". This may be a response by some managers to uncertainty about the future direction of technological developments, with fears of rapid obsolescence, new equipment failing to withstand the rigours of use, and spare parts being unobtainable as companies close or equipment models change. Once a commitment has been made by management to install a new production system there is no turning back to the traditional production system because of the cost involved.

Livingstone and Chang (1980) maintain that in the U.S.A. food service industry (which as in the U.K. is very labour intensive), the use of catering technology in any form has not reduced the 'people' input and brought about increased 'productivity' output. However, there needs to be more research to clarify this assumption, which is contrary to the main body of literature. This assertion was also made sometime ago before the widespread uptake of new technology.

In order to increase productivity, through the use of technology, Milson & Kirk (1980) suggests that it is not always necessary to refurbish the whole production system. Reorganisation of the work or production equipment used may improve productivity.

Limited re-equipping has also been found to be successful within hospital kitchens adapting to cook-chill production. MacDonald (1985) confirms that catering equipment already in use can be incorporated into re-organised production systems. Even though the equipment remains the same, the system now utilised is the manufacturing approach of long production runs of 1,000 portions of one menu item instead of the traditional kitchen operation of short production runs of many items. Donaldson (1971) refers to a systems analyst who applied industrial engineering techniques, to the ganymede tray system and increased 'output' by 23% by reducing errors on the plating system; this was achieved by spacing trays correctly on the conveyor belt.

Husk (1971) points out that with food and labour costs increasing, and a decline in the number of skilled qualified chefs who can prepare food from the raw state, a cook-chill centralised production system is a very attractive proposition as it enables a reduction in the number of skilled chefs by concentrating them in one area. Johns, Wheeler and Cowe (1992) also state, from their research into sous-vide, that it is necessary to produce such items in a self-contained unit to maintain quality and control production techniques. "Quite clearly there is an inherent productivity advantage in the production of meals by using technology. Production line techniques and process standardisation enable the efficiency of labour, material and energy use to be maximised."

Metz (1990) suggests shortened cooking lines (reduced à la carte menus) and increased use of multi purpose equipment and labour saving work stations to prevent staff walking long distances, could assist with staff shortages and also save on energy resources.

It would seem that Food and Beverage managers are demanding new technology for hotel kitchens to achieve better standards of food and quality menu items. This in turn influences food sales which contribute highly to profit and to productivity (Townsend 1991). According to Simons (1991) using modern technology, such as computer controlled combi-ovens, can offer the chef both better control and productivity when compared with traditional production equipment. In an example, for a 360 cover banquet, seven chefs were required and sometimes the food was served cold; with new technology only two chefs were required and the food was always hot. "With the old equipment the roast would come out of the oven to be carved onto the silver flats. Now food prepared the day before can be regenerated either on silver flats or plates. Also cooking in advance gives us the added advantage of slow cooking process to achieve better quality and portion control." (Malherbe as referred to in Simons 1991).

With the difficulties in retaining qualified, experienced chefs and their nomadic attitude towards gaining new experiences, it would seem that even within hotels and hospitals using traditional production systems, new technology can save money and cut labour costs. Higher productivity can possibly be obtained through skilled staff who are at ease with using new technology, (Scoviak and Learner 1990). The new multi-functional, labour saving equipment is better adapted to meeting the needs of the modern catering industry.

Productivity can also be related to the designed space required within organisations. Metz (1989) points out that hotels are expensive and therefore it is necessary to fit a more efficient kitchen into a smaller space; this implies less room for people, therefore "labour saving features are crucial to new kitchens". It would seem that "budget, menu, space, schedules - these are the factors that have always driven kitchen design, now we have to include staff".

A possible method of overcoming the problem of space and recruitment of skilled staff could be the use of technological systems within hotels. Although a few hotels are using the cook-chill sous-vide production method in a limited form, very few hotels are using it to its full potential. Cippola (1990) confirms that many managers are seeking production systems that are unique for their own individual operations. He states "cook-chill is a comprehensive concept designed to help food service managers operate their complex challenges while improving efficiency and profitability".

3.2.4 Operational Economies

Operational economies often go hand in hand with increased productivity. However, the literature often deals with these as a separate advantage of utilising technology. Within the hotel industry, manpower is widely recognised as a large element of operating costs, (Pine 1987). Although it has been affirmed by many authors (Mercer 1981, Hutchins 1980) that the hotel and catering industry is a low technology industry, this concept is slowly being eroded by progressive management, partly as a result of the difficulty in recruiting well trained/qualified staff. High energy costs and improved services are also important motivators.

Synder (1983) points out that a good food production process minimises energy and labour needs and optimises production time and product yield. The direct operating costs of labour, materials, overheads and energy constitute the major aspects of cost for the hotel and catering manager. But the amount spent depends on the food production system used and on the efficiency of that particular service. Herz and Souder (1979) conclude from their research that it is possible to reduce labour requirements and food costs by using either a cook-chill or cook-freeze production system. These also provide the most economical hospital food service system when compared with traditional and convenience food operations, even with the increased costs of capital equipment and energy needed. However, Light and Walker (1990) state "accurate costings which are readily available for comparisons are relatively difficult to find in the U.K." No doubt cost appraisals have been and are carried out, but detailed, full costings are rare as commercial interests limit publication of results.

Decareau (1982) suggests that using automated large-scale food production systems, e.g. 'cook-chill' within hospital catering, offer the potential of significant reductions in labour costs. However other research, (Light and Walker 1990) indicates a negative response from staff using cook-chill, as their earning capacity is reduced (by working straight shifts with no extra or weekend overtime). Their motivation to work at a cook-chill unit may also be affected, although managers can offer incentives, e.g. training, day release, productivity bonus.

Figure 3.2.1 Changes in Hourly Pay Rates following Cook/Chill Introduction

HOURLY PAY RATE	No. OF UNITS	%
Increased	11	15.1%
Decreased	6	8.2%
Stayed the same	56	76.7%
TOTAL	74	100.0%

Source M Light and A Walker 1990

Figure 3.2.1 illustrates changes in hourly pay rates after the introduction of cook-chill units in the U.K. Such examples are not necessarily helpful. Despite hourly pay levels being largely maintained or even increased, even in a situation where motivation is reduced, overall labour costs may well fall if the productivity gains previously referred to are achieved.

3.2.5 Technological Food System Models

Although traditional food production systems will remain in the industry, the greater productivity requirements of hotels and hospitals will necessitate increased use of catering technology. Booth and Dudley (1989) confirm that the major technological advances today in the catering industry are in the area of chilled meals. This assists management in various areas to obtain consistent standards, and quality, plus savings on staff and capital resources. In seeking these, however, it is important that food safety issues are also taken account of in the design. Chilled meal production is most suited where there are known numbers of people required to be fed in large groups at specific times, e.g. hospitals, school meals, industrial catering, hotels with large banqueting business.

Escueta et al (1986) have classified hospital food production systems into traditional production (4 component systems) and cook-chill (6 component systems).

Figure 3.2.2 Traditional Cook-Chill Model

Traditional	Cook-Chill
Food purchased	Food purchased
⇓	⇓
Prepared	Prepared
⇓	⇓
Cooked	Cooked
⇓	⇓
Distributed to patients	Chilled
	⇓
	Reheated
	⇓
	Distributed to patients

(Source Escueta et al 1986)

All the preparations mentioned are for bulk cooking and distribution but the process would also be useful for a plated meal process.

Jones and Huelin (1990) refer to Escueta et al (1986) and their 6 component system which is more applicable to hospital catering and acknowledge that there are variations on this model by other authors; however they have developed a ten stage model which incorporates food production and service and is appropriate for both hospitals and hotels, encompassing the major changes within traditional food production systems, with the use of fully prepared meals requiring "holding" and "regeneration". This allows for de-coupling of production from food service when cook-chill or sous-vide catering technology is used.

Figure 3.2.3 A ten stage model for production and service used within hospitals and hotel catering operations.

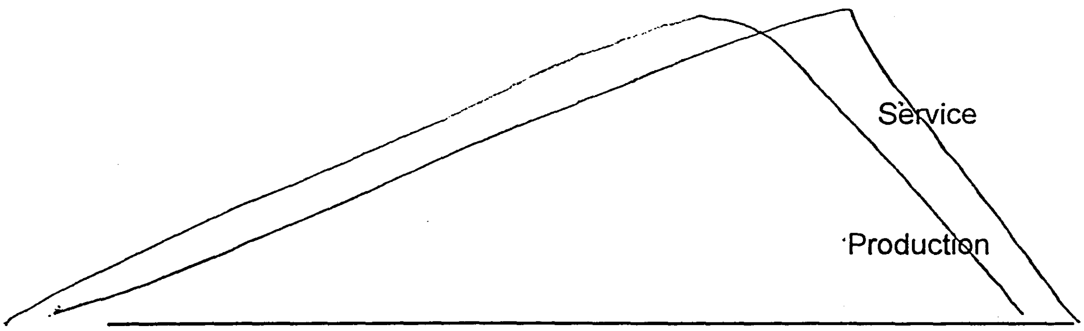
Storage
⇓
Preparation
⇓
Production
⇓
Holding
⇓
Transportation
⇓
Regeneration
⇓
Service
⇓
Dining
⇓
Clearing
⇓
Dishwash

(Source: Jones and Huelin 1990)

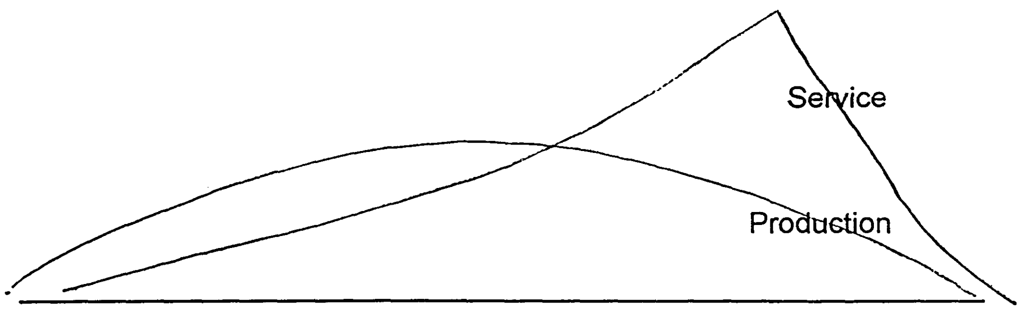
Jones (1988) maintains that the real relevance of cook-chill is in the decoupling process by which food production can be carried out separately from customer demand, either in terms of time, or place or both. Certainly with this process the demands placed on staff are lessened since the 'peaks' are removed from the production operation. This allows a longer production process to develop, as food produced is not for immediate consumption. He also affirms that "organisations implementing decoupling will become quite distinctive in organisational terms and that employees will tend to become factory hands rather than skilled chefs".

In either 'hybrid technologies' such as cook-chill or sous-vide it is necessary to employ some skilled qualified chefs to understand the cooking methods involved and to recognise the acceptability of food for customer satisfaction. However unskilled staff can undertake the basic preparation of the production system and semi-skilled staff can assist in the service. Jones (op cit) also states that "productivity will also be lower if peaks and troughs are not adequately dealt with either by smoothing demand 'decoupling' or adapting supply". Therefore the use of technological systems can be potentially beneficial to the caterer. As Fuller and Kirk (1991) state, if the buffer stock consists of pre-cooked chilled foods, which only need reheating, this allows a greater de-coupling of production and service. In turn this leads to greater production smoothing and increased productivity and quality control, as emphasised in the following diagram.

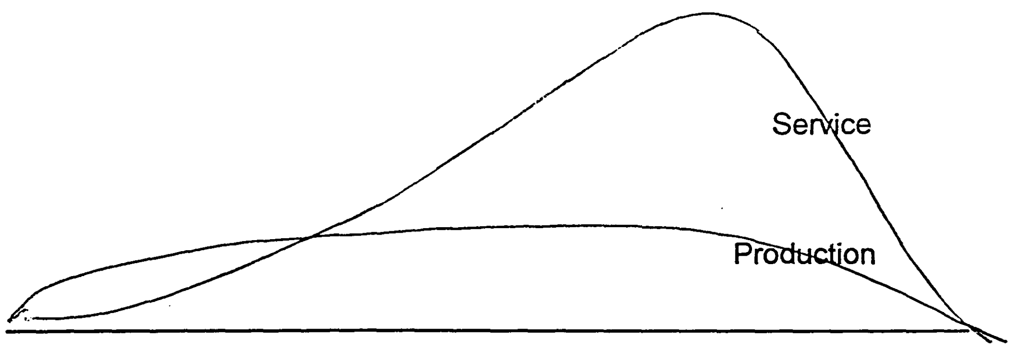
Figure 3.2.4 Relationship between production and service for a catering operation



(a) NO DECOUPLING (e.g. Pub Restaurants)



(b) PARTIAL DECOUPLING (e.g. Traditional Hospital Production)



(c) TOTAL DECOUPLING (e.g. Cook-Chill)

Source: J Fuller and D Kirk, (1991)

3.2.6 Customer Satisfaction

Customer reaction to pre-prepared foods needs to receive fuller consideration. Kaplan et al (1969) suggests that to overcome the problem of patients' misconception and prejudice, good communication skills need to be used by catering managers. Light (1988) states that training and customer relations play a major role in successful implementation of cook-chill systems. Also inclusion of popular foods on the menu that were never served under the traditional production system helps to alleviate this problem (Kaplan et al op cit).

"Possibly the proper focus for technology and innovation is to find cost effective ways to reduce the rigidity of current systems and create more flexible responses to customer needs" (Kipps and Middleton, 1990). With reference to hospitals, they maintain that this could be created with the use of various chilled or frozen menu items being reheated on the hospital wards at the patient's request. A mobile cafeteria system would also help to reduce plate waste with the annual figure often as high as 30%. Some hotels are using chilled foods for room service to maintain consistent quality control of their menu items for customer satisfaction.

Kipps and Middleton (op cit) suggested too many hospitals are serving 1970s food to 1990's customers. They suggest that cooked chilled food regenerated at ward level offers better oganoleptic properties than either frozen or bulk produced foods.

3.2.7 Technological Change and Training

Whether a cost reduction or increased productivity emphasis is preferred, there is widespread agreement that the role of the human resource changes as a result of the introduction of technology and that training is a key component of successful introduction of technological change. For change to take place managers must be aware of their staff's needs and provide reassurance that their practical skills will still be required. Rhodes and Wield (1985) state that "where technological change is sought, planned or effected there is generally a need for interdisciplinary working". Some hotel and catering managers have difficulty in visualising how operational change can improve productivity and the work environment. As Shostack (1984) states the operations side of service management often uses specialist work flow design and control methods such as 'time and motion'. These procedures provide catering managers with a way to understand a process and to define and manipulate it at arms length. Nevett (1985) also maintains that to make technology work, managers must become more familiar with operations techniques and their application to food production and service.

Research carried out by Skroder (1981) confirms that to achieve a successful catering operation, there must be a balance between raw materials and technology on one side and of manpower utilisation on the other. "No balance is right, if there is not a satisfied guest as the final result of operational efforts." It would seem there have to be deeper discussions between planners and operational managers to make provisions for people-orientated operations, that may require employees' judgement and a less mechanical approach. It is important to get the balance right. Pine (1987) agrees that "people block the innovations that technology may bring through lack of knowledge or fear of being replaced by a machine."

According to Mathieson (1989) the catering management team should be familiar with the detailed pre-operational training procedures for all cook-chill employees and the 'ins' and 'outs' of the cooking process. This would require a complete shift in management attitudes, as in the traditional production system only the 'chefs' would be involved. This view is supported by Rhodes and Wield (1985) who state that, while attention has been paid to technical development of production systems, insufficient efforts have been given to the training and implementation needed by employees.

Dixon (1991) refers to staff training and understanding concerning cook-chill. "The concept the chefs had was that they were going to be working in a factory environment when they heard the phrase 'production kitchen' but they soon realised that their skills were not lost." It would appear that good communication is essential when taking staff from the traditional production environment into a technology-based production system. Chefs employed within a cook-chill or sous-vide production system need to have a different attitude and respond to and understand the technological demands put on them, regarding correct temperature control and the need for standardised recipes to achieve the required quality control of the product. The chef's perception of the quality and safety requirements of chilled foods is enhanced by better training and understanding of the necessity of working in a controlled environment. As Haywood (1990) maintains, introducing a new technology process requires a new management strategy which integrates the technical and human resources of a catering business. "It makes no sense to turn over an expensive capital investment to poorly trained or unmotivated employees." This wider organisational change perspective seems very relevant and has been pursued in "Organisational Change" (section 3.4).

3.2.8 Summary

The literature review shows that a food production and service facility is a highly complex process which must, among other things, take into consideration the volume and type of food to be prepared. Whether such a facility supports a small restaurant serving as few as 100 customers a day or a large central production unit producing 10,000 meals per day, the components of the production system are similar and the interaction of equipment, raw material, and people is complex even without the use of technology.

It is of vital importance that hotel and catering organisations assess customers needs and reconsider what their service offers the customer. In introducing technology, without consideration of customer satisfaction, the 'output' side of the productivity equation cannot be realised.

At its best, when introduced in a thought out, scheduled way, catering technology can offer a simpler more efficient production system for staff, and food that can be cooked, chilled, and regenerated or served almost immediately, either for hospital patients or hotel guests. This will both increase productivity <u>and</u> tend to increase customer satisfaction. However, for these systems to work and desired outcomes to be achieved, staff involvement and training are essential and the process of change requires careful management.

3.3 DETERMINATION OF KITCHEN EQUIPMENT AND LAYOUT

3.3.1 Introduction

Design and planning of Hotel and Hospital kitchens is a complex process. It is important to take all relevant aspects into account before producing feasible solutions. To determine the precise requirements of a given operation requires a great amount of analysis and experience. It is essential to assess each component part (wash up area, stores etc.) in terms of its place in the total system. All components are reliant upon one another. Wrong positioning of one area could affect the effectiveness and efficiency of the whole operation.

It is vital to include people with a knowledge of the operation in the planning process; Furnival (1977) confirms that it is important that a practical 'input' from a chef or caterer should be included at the design stage. This person should place theirself in the position of the operative staff who will be working in the kitchen. Uncomfortable, crowded, noisy conditions are not conducive to safety, good work, or reasonable profits. It is easier and less costly to detect and resolve such problems on the architect's plans rather than after the area has been built. "Good effective kitchen design implements both good work flow and work study principles, minimising back-tracking and unnecessary handling of food while providing adequate, but not over-lavish work space" (Furnival, op cit).

As Jenkins, referred to by Beishon and Peters (1987) states, "Systems engineering is the science of designing complex systems, by the efficient use of resources in the form of men, money, machines, material, so that the individual sub-systems making up the overall system can be designed, in order to achieve the overall objective and interactions in the most efficient way". This is as relevant to kitchen design as it is to any other design process.

3.3.2 Kitchen Design and Planning

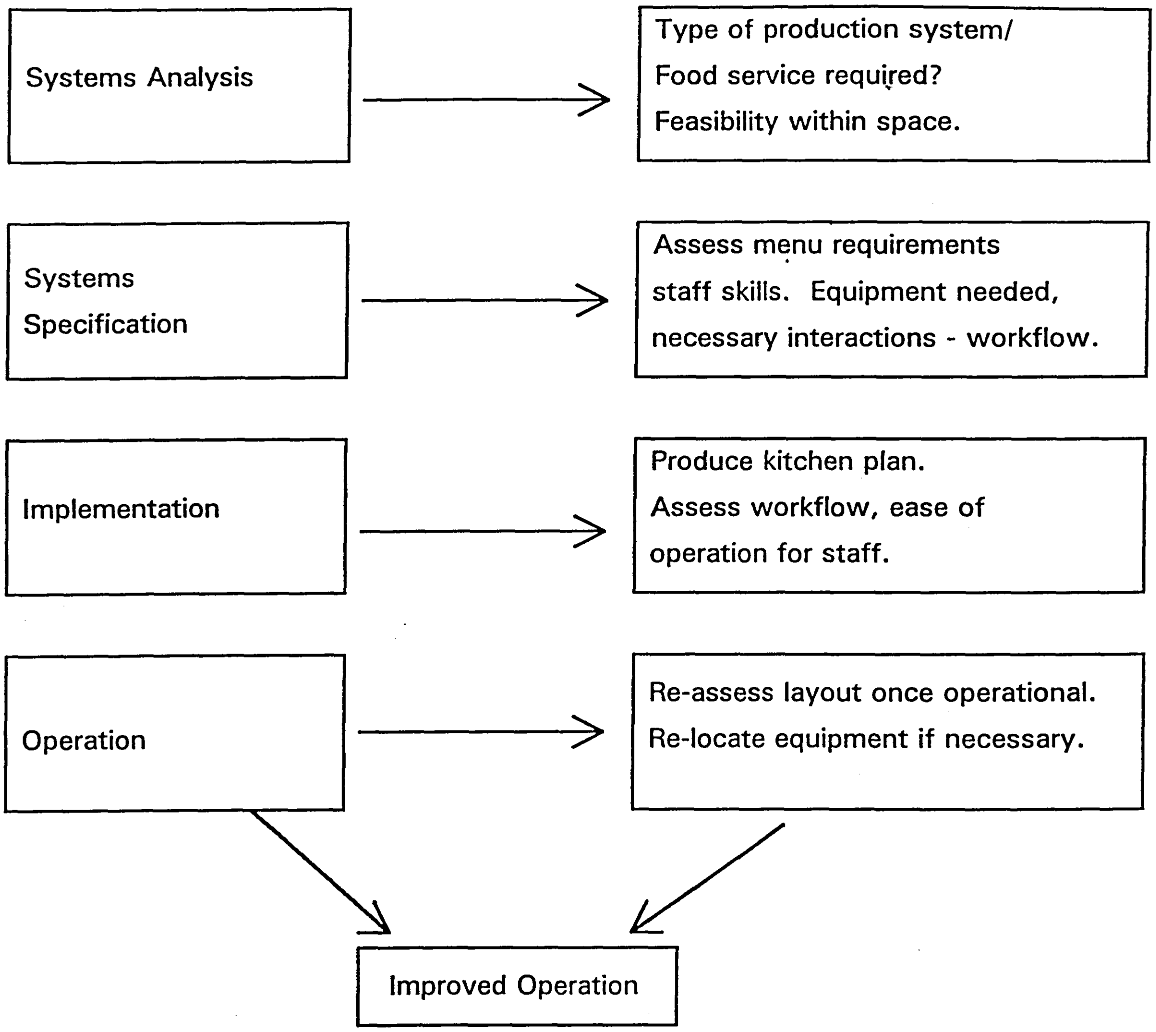
A systematic approach to kitchen planning and design is essential in order to include all relevant criteria and interactions between all functions.

Design is defined by Kazarian (1975) as the "broad function of developing the entire food facility including the original concepts of operation, site selection, equipment requirements and other planning functions necessary to develop the concept into structural and operational reality". Design therefore incorporates consideration of the basic concepts whereas planning translates these decisions into specific equipment requirements and layouts. In the literature the words design and planning are used interchangeably by different authors, but for the purpose of this critical review they will be used in this particular sense.

A well designed facility is developed by utilising basic principles from many areas of knowledge. These can be incorporated in the planning process for the arrangement of layout of spaces, workplaces, equipment and aisles to allow the smooth flow of materials and employees.

According to Stewart (1990), the design of a kitchen always begins by collecting information. He recommends that operational, physical and financial information is required and that everyone connected with the project needs to be consulted.
It appears that the operational aspects (food production to service) of a project are often the most complex, rather than the physical and financial constraints. Unfortunately, operational aspects are rarely given the design prominence which they should command.

FIGURE 3.3.1 Systematic Approach to Kitchen Planning and Layout



Source: Adapted from Jenkins (1983)

Many production kitchens are planned without considering flow of work or the hazards associated with poor layout. These are then left for the chef to work around.

(a) Layout

Within a kitchen, inter-relationships between stages of the process are important. Lawson (1975) states that the "work triangle" is a technique used within a working kitchen to ensure that everything required for the cooking process is conveniently grouped together within a compact area. The "work triangle" however is a theoretical layout for an ideal path to be followed in an ideal kitchen. In practice, there may be several reasons why this cannot be fully adhered to, including such factors as physical building constraints. Lawson (op cit) found that several factors affect the efficient positioning of equipment within such work centres. These include arrangement of equipment, and the limited reach of staff, which affects the multi-purpose use of facilities.

Layout configuration of the 'work-triangle' is a basic rule, but one which may need to be modified. Some examples of various kitchen layouts to be found are: the single straight line layout (where everything is set against one wall), the L-shaped layout (used when linear space is limited) the U shaped layout (this provides the most flexible layout and is ideal for small areas), and the centre island.

Milson and Kirk (1979) confirm that space available and location of services including the labour-intensive operations (e.g. preparation of vegetables if not bought prepared) mean that the layout of the food production area is of great importance.

(b) Other Planning Criteria

There are other criteria involved in kitchen planning, which may affect some layout decisions along with the basic criterion of flow, to be evaluated before arrangements are finalised.

Figure 3.3.2 Criteria for Evaluation

KAZARIAN (1975) assesses these as:	KIRK (1989) assesses other aspects:
a. Efficient use of utilities and equipment	a. Hygiene and good working environment
b. Efficient use of skilled labour	b. Correct equipment for main skills of staff, sales mix.
c. Safety, e.g. if based on flow alone the arrangement of equipment maybe hazardous & safety would override flow.	c. Adequate storage, equipment.
d. Efficient use of spaces.	d. Flexibility and mobility of staff and equipment
e. Environmental factors, some equipment isolated due to noise or odour	e. Financially controllable for staff and energy resources.
	f. Capable of expansion or adaptation for production volume

Basically the criteria have evolved, rather than changed dramatically from 1975-1989. Kirk does emphasise the change in flexibility of staff and multi-use of equipment and the necessary factor of taking financial implications into account. Other aspects to be considered would be menu production and consumer needs.

Planning a kitchen layout is not a clear cut process of stages and specifications to follow. Every situation is different and has to be modified accordingly.

It would seem that theoretical layouts should be balanced with a functional efficiency, within a more generalised form of area, possibly a square, to allow flexibility for future changes in production systems. This would have to be cost effective to incorporate all the 'inputs' necessary for the required 'outputs' of production and service. Another aspect emphasised is the importance of a good working environment to attract and retain competent staff.

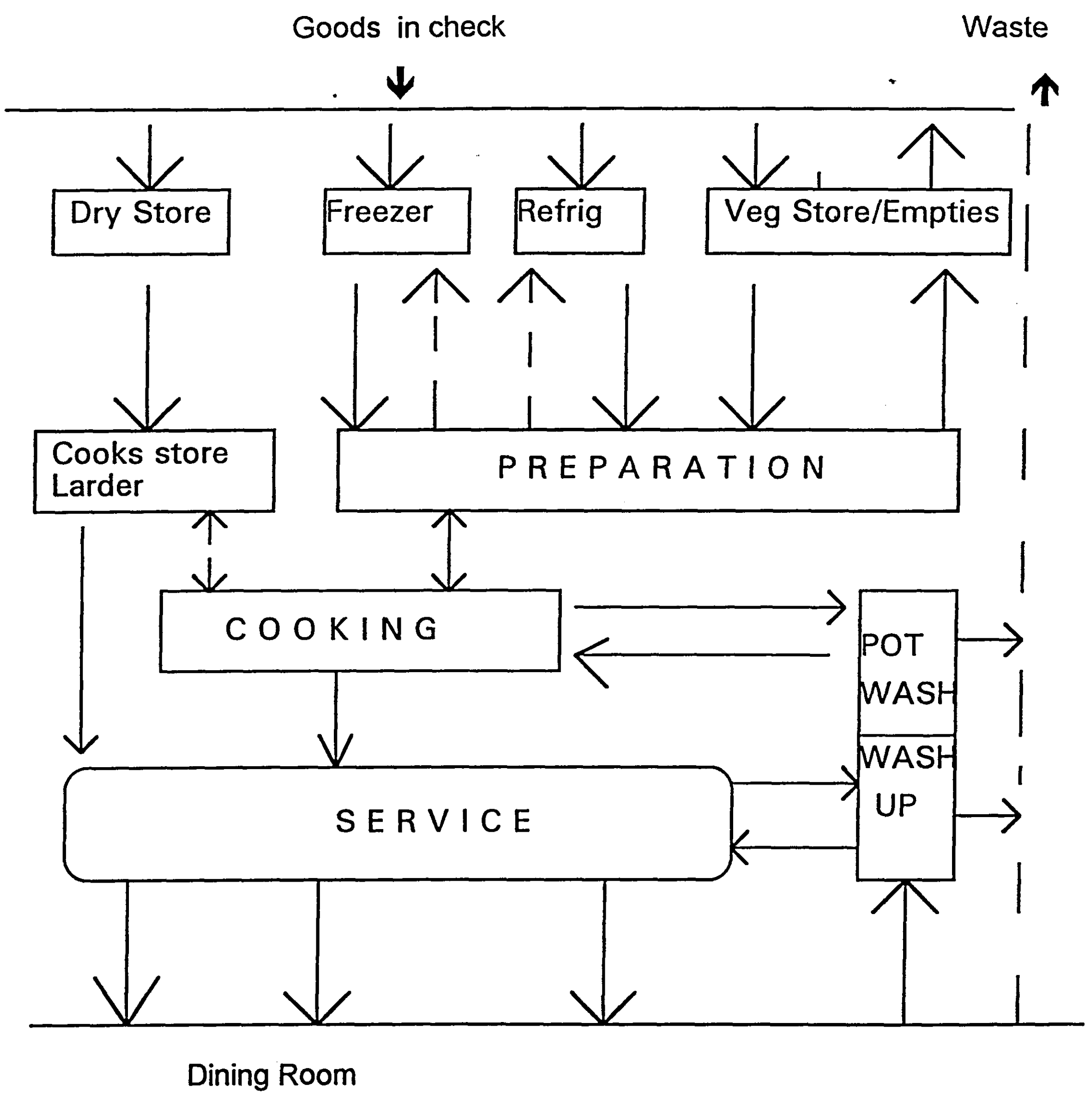
Kotschevar (1968), suggests that to plan an efficient layout, the technique employed by most designers is first to define certain broad requirements of menu production and then to develop the details for the overall plan. Shostack (1984) confirms that at the planning stage, the architect must plan and consider every encounter between the production and service areas to provide good flow of staff and commodities.

The consumer whether (customer or hospital patient) is the determining factor; the aim of any catering establishment is to satisfy the needs of the consumer who is the receiver of the service. Therefore all the stages of food preparation which lead to the actual serving of food are of vital importance.

(c) <u>Work-Flow</u>

Kazarian (1975) maintains that flow of work has been identified as the most important criterion for layout planning. A wide range of processes is carried out in a kitchen and therefore arrangements must be designed to provide for efficient flow of work from one stage to the next.

Figure 3.3.3 Work Flow Charting Main lines of Flow between Traditional Kitchen Areas



Source Furnival (1977)

(d) Poor Planning

In many instances kitchens are planned with little thought for the end product, for ease of production or for the movement of the chef, who may have to produce a menu in a confined space with equipment that is limited in use without consideration of operation or flow of work.

Giampietro (1980) argues that many food service facilities have been designed without regard for the real needs of the operators, because those involved in the planning ignored the overriding consideration which should be "to make the design and equipment compatible with the menu and service offered".

Too many facilities are planned by equipment manufacturers to fit the space available, rather than conforming to a pre-determined program required by the catering establishment. It is the view of Kirk (1989) that the decisions made by equipment manufacturers are usually more concerned with marketing criteria than production criteria. Beer (1990) also considers that in planning a kitchen, whether for a hotel restaurant or food facility, it is essential to have a "kitchen that works" and that food produced reaches the customer in a safe well organised flow system. As stated by a user in the "Independent Caterer", "It is my aim that a kitchen should flow and the proprietor and chef should be involved with the planning. There is no point in planning a kitchen and then the chefs come in and condemn it".
(Anon 1990).

Castle (1989) also agrees that kitchen planning often happens almost by accident. Meticulous care is given to choice of restaurant decor, lighting and menu. What happens in the kitchen depends often on how much time and space is left. The majority of kitchens are usually planned by the architect, without consultation and feedback from those who have to work within them.

One disadvantage may be that the equipment company planner has a vested interest in installing all the conventional equipment first, with the addition of specialist equipment, if space allows as an optional extra; rather than equipping the kitchen tailored to the menu and ease of operation.

3.3.3 Working Conditions and Use of Labour

Factors connected with labour retention are explored elsewhere but it seems that improved working conditions for chefs are becoming more important. According to research carried out by a Norwegian professor, referred to by Schneider (1988), chefs and kitchen workers have a higher incidence of lung cancer than most workers through working in poorly ventilated kitchens. Rozario (1988) argues that kitchen design should allow the efficient use of space which provides an environment which is comfortable and safe for staff to work in. In discussing the design of the Savoy Hotel, Edelman (1986) states "We spent a long time planning the kitchen to minimise movement of food and staff and create a comfortable working environment". As the hotel and catering industry is labour intensive it is vital that labour resources are used effectively and efficiently. According to the International Labour Office (1979) the objective of the planner should be to ensure the well-being of the worker "through the attainment of optimum working conditions and by the most suitable use of physical characteristics and physiological and psychological capabilities". This should be achieved by developing the most comfortable conditions regarding lighting, climate, noise level, reduction of physical layout, improving working postures and reducing the effort of certain movements.

3.3.4 Equipment

A wide variety of catering equipment is available on the wholesale market for mass production, fast food or a la carte menus. Selection must be on the basis of particular requirements, which should be carefully assessed. The offer of "free design" by catering equipment companies may entail the block provision of a standard type and amount of equipment, without taking into consideration the specific equipment needs of an individual kitchen appropriate to menu and staff skills. Pine (1989) states, "the sort of demand that customers make on catering operations will obviously influence the equipment needed to help the chef/caterer to satisfy demand".

There are many variations of catering equipment on the market all specifically designed to aid production. The chef/caterer must be made aware of the purpose of the equipment and the volume expected in a throughput of commodities to prevent duplication of equipment being purchased. This is referred to by Taylor (1977) and Lawson (1978) who agree that many traditional designed kitchens are over equipped, therefore valuable kitchen space is under utilised. Kirk (1989) confirms that "kitchen equipment occupies the majority of space in any kitchen layout", with possibly some not being used.

As modern production systems become centralised, within many catering operations traditional catering equipment needs to be replaced by more specialised multi-purpose technological equipment to save on labour and energy costs.
Lawson (1978) and Fuller and Kirk (1991) emphasise the necessity and benefits of multi-purpose equipment in controlling energy and maintenance costs, and assessing correct production quality. Kipps and Middleton (1990) agree that equipment must meet the volume and capacity needs of the expected customers, while at the same time equipment must be designed for maximum energy savings, including lower temperature cooking to aid quality control. Kelleher (1989) maintains that "equipment manufacturers are trying to answer a demand in the market for equipment that will do more, and do it faster, without diminishing the quality of food". Hines (referred in Rowe (1991) confirms "once you would walk into a kitchen and find 25 feet of solid top ranges, now you find bratt pans, combi-ovens and microwaves.". Rowe (op cit) states, "they can offer more choice on the menu with less catering equipment". Modern equipment occupies less space for a given output and allows more staffing flexibility since more meals can be produced with fewer staff. A well planned kitchen has the ability to meet the drive for greater efficiency and savings with modern multi-purpose equipment, incorporating fast heat-up recovery rates and operating at a third of the usual energy costs.

(a) Multi-Purpose Equipment

Difficulties in recruiting well qualified experienced chefs have led to the need to consider more use of versatile equipment. According to Metz (1990) "In response to development and operating costs and the shrinking pool of qualified chefs, kitchens are becoming smaller and more labour efficient". An increase in the use of multi-purpose equipment to accommodate menu and concept changes is required. Every caterer working within a strictly controlled budget knows the pressure to make the best use of staff and food to achieve good meal quality; now new production systems and catering equipment have been developed to help the chef achieve better standards and food quality.

From his research Rowe (1991) finds that the trend towards smaller kitchens and the use of more multi-purpose equipment (e.g. combi-ovens) enables chefs to plan production schedules more easily as the equipment is more versatile; but it is vital that staff are trained in the uses of the equipment, which otherwise may not be used to its full advantage. Scoviak-Learner (1992) reports that equipment such as combination ovens also provides more flexibility in menu planning. Skroder (1981) confirms that the costs of commodities and labour is increasing, therefore the demand for labour saving methods and use of technology will also increase. Kitchen layout and the type of equipment used has a direct influence on the time spent by the chef moving around between various working sections, and assessing the production cost of employees involved becomes difficult.

(b) Equipment Requirements

It is difficult to assess which items of equipment will be used most frequently. Numerous methods have been devised to analyse food production processes and authors assess equipment use differently. Kotschevar (1968) suggests the flow process chart which analyses each step required to make one menu item; also the time-work record of man in relation to machines. Taylor (1977) and (1980) referred to by Kirk (1989) proposes a method of estimating total equipment requirements based on the total amount of energy needed to process the requisite amount of food. This method could be used within a central production unit with a limited menu or in a fast food restaurant with an anticipated knowledge of customer demand.

Stevenson (1985) gives estimates of equipment needed by breaking the menu down into precise cooking methods, e.g. so many ovens required for the production of baked or roasted items. This calculation could be useful within a restaurant offering a la carte menus. It would be useful to assess volume of production within large catering operations and use appropriate large scale equipment capable of bulk production. Possibly time and motion techniques could be employed to assess the feasibility of one employee operating 3 or 4 bratt pans instead of two. Changes in the food supply chain resulting from new techniques will also affect equipment needs. For example frozen and chilled convenience foods are providing the institutional sector with a wider selection of labour-saving products. Morey, Valentine and Olsen (1980) refer to new types of convenience foods and affirm that modern equipment may offer further potential for increased menu flexibility and service. However, it is also feasible that the use of more convenience foods especially frozen vegetables, would enable managers to increase productivity without too much investment in new equipment.

(c) <u>Production Equipment Layout</u>

It is possible that economic restrictions may decrease kitchen size while retaining maximum output. Therefore more specialisation, both in equipment and concentration of work, becomes necessary. Where this occurs the equipment must be carefully sited to allow for multi-purpose use, e.g. combi-ovens can be used for cooking vegetables and steaming meat puddings. This prevents duplication of production equipment which increases capital costs.

The adequacy of space will influence building, operating costs and efficiency. Where space is too small, labour time and effort are likely to increase, volume and quality decrease (Lawson 1978). Kazarian (1975) confirms it is important to get the balance right with space specifications and to consider relevant criteria. The following points are identified:

1. number of meals
2. functions and tasks to perform
3. equipment requirements
4. number of work sections
5. space for movement

Design and layout indicates spatial allowances, physical facilities, construction features and work areas with required equipment located to enable flow of work.

Synder (1983) reports the development of a kitchen design model that can be used by small restaurants operating batch food preparation. The model 'input' is based on the meal count per day, the style of restaurant and the volume of food turnover during a defined period of time. The 'output' includes the amount of food processing equipment, food storage space and the kitchen and dining floor space. It appears, according to Napleton (1990), that kitchens are being designed to increase productivity through more efficient use of personnel and equipment, with less usage of space and wastage of energy in a cooler, cleaner and clutter-free kitchen environment. Another reason for using technological systems is to save space. For example, Schneider (1988) confirms that after land, space and price is at a premium and the majority of hotel managers are trying to use space at an optimum level; space-saving equipment is therefore an essential element for the kitchen designer.

According to DES Building Bulletin 65 (1986) there are two basic methods of arranging production equipment, "although in reality it is likely that a hybrid of the two will be used". These are process layout and product layout.

Process Layout

Equipment and associated preparation spaces are grouped together for a definitive cooking process e.g. steaming. Therefore all steamers would be grouped together for any food item requiring steaming, e.g. meat, vegetables or puddings. This may typically be found in Hospital or School Meal Catering.

Product Layout

Here equipment and preparation space are grouped together to prepare a single product or group of similar products (e.g. larder section), which would have all the preparation area and machinery to produce its menu dishes. A process layout can make fuller use of equipment but food has to be moved around the kitchen. The product layout is commonly found in a large 5 star hotel kitchen. With present trends towards technological systems (e.g. cook chill/sous-vide) traditional cooking methods are still employed but multi-purpose equipment is being increasingly used to speed up the cooking process to allow the chilling of the product to take place within an allotted time span.

3.3.5 Impact of Modern Food Service Systems

The aim of new modern processes in any kitchen is to cut out loss in time and speed up productivity. Changes in demands and customer needs are a highly influential factor on this. It is also important for the designer to discuss with the chef the implementation of new techniques (Stewart, 1990). The client may not be aware of the current technological and operational development which are available.

Carroll (1980) confirms that it is necessary to analyse various food service systems (such as cook-chill, cook-freeze and traditional production) thoroughly before making a final decision on new kitchen and food service designs, to assess which system would be the most effective within the existing operational constraints.

It is clear that for a catering operation to increase its productivity or profitability, it needs to maximise the output or revenue generated while minimising its operating costs. For this to be achieved a change in emphasis may have to be made, from the traditional production technique of cook-serve to decoupling. Although McDonalds (fast food) is a cook-serve system it only offers a limited menu produced by high technology equipment, to allow a fast turnover of customers. This in turn requires the executive chef or caterer to understand that production planning/forecasting needs to be considered to control material and labour costs. Also staff training needs to be provided to benefit from using technology and multi-purpose equipment. Although catering managers are usually willing to invest capital into catering equipment they often overlook the need and importance of providing proper training for their staff to use such equipment/technology to its full advantage. Pine (1989) confirms that "Proper training for catering staff is essential to ensure the correct operation of equipment".

Proper training and the understanding that selected pieces of catering equipment can assist staff in saving time and increase productivity is to staffs' advantage. Giampietro (1980) states that the new food preparation machines and catering equipment have been greatly improved to meet the designers' and managers' demands for economy in space, time, labour and maintenance; with a resulting improvement in productivity. Progressive changes in the economic, social and technological environment have encouraged the development of modern, sometimes revolutionary changes in catering equipment and catering systems design (Pine 1989).

Ceserani and Kinton (1989) state that the purpose of kitchen organisation is "to produce the right quantity of food to the highest standard, for the required number of people, on time, by the most effective use of staff, equipment and materials, regardless of whether the organisation is simple or complex".

3.3.6 Summary

People (i.e. designers - chefs - managers), who are involved with catering system design and layout planning at its earliest stage must carefully consider what is required. This will involve consideration of menu design, type of customers expected and skill of staff employed as well as the different food production systems available. It is also important that training is given to all kitchen staff involved with equipment to obtain optimum utilisation and control. In many instances this can only be achieved via creative and effective initial planning and a complete involvement of relevant staff. In some instances this may also require an organisational change.

3.4 ORGANISATIONAL CHANGE

3.4.1 Introduction

Historically the hotel and catering industry has been a labour intensive operation with emphasis being placed on employee skills. A high turnover of staff is seen as a normal phenomenon as the workforce of skilled/semi-skilled employees is often predominantly young people who move frequently to obtain promotion and gain new experiences offered by various catering sectors.

It would seem this traditional culture is in the process of rapid change, brought about by the implementation of various forms of catering technology, mainly to assist in the productivity and quality control needed for the volume of business and to conform with new legislation.

Catering technology is not being used totally to replace skilled staff but in many organisations compensates for the decreasing availability of skilled personnel due to demographic trends, and the unsocial working conditions. It also potentially offers the manager a product of a consistently high standard together with enhanced productivity. Therefore, today's managers need to consider the benefits of retaining and training employees in the acquisition of new skills. This also potentially enhances staff motivation which additionally affects productivity. A knowledge of principles and techniques involved in the management of organisational change is relevant to understand those developments.

3.4.2 Hotel and Catering Employees

(a) People attracted to the Industry.

The hotel and catering industry relies heavily on seasonal workers, agency staff, part-time staff and foreign labour, as well as full-time employees. Due to the large number of foreign staff, some feel that the industry is rather 'un-British'; however the industry could not dispense with this source of labour. It is also seen as being technically backward, and with little skill, attracting too many 'nomadic' or non-conforming members of society; and affected by "dishonesty, psychological perversion and delinquency" attracting all kinds of people from society. (Mars, Bryan and Mitchell 1977). Boella (1987) States " ... I don't know how they stick it ... I'd go potty if I had to do it". With such feelings there is little hope for operative staff being motivated, or valued for the job they are doing. Many managers see little point in spending money on people and developing their skills when so many leave. As Taylor (1986) mentioned in his inaugural speech "The service industry is to care and show concern for those it serves .... often not translated by the hospitality industry in its approach to its staff".

(b) Labour Turnover and Productivity

Labour turnover is a term describing movement of staff into and out of employment within a firm. High turnover is seen as damaging by reducing profitability and quality, and can also indicate that staff may not be content with their relations with managers or with their working environment or conditions of employment. However managers may regard high turnover as something over which they have little control, and that it is merely an inevitable fact of the industry. Labour turnover is also welcomed in some sectors of the hotel and catering industry who encourage energy and enthusiasm which can be generated by young employees. If staff remain too long the employee can become bored with the repetition of the work. After two years the employee becomes 'permanent' which increases labour costs and budgeting controls for the employer.

However, these views are not held by all in the industry. For example, according to Denvir and McMahon (1992) a satisfied, motivated and stable workforce is a critical success factor. Samuel (1969) confirms that high labour turnover has a substantial and detrimental impact upon the organisation, and results in a significant loss of productivity through the breaking up of teams who are used to working together. Denvir and McMahon (op cit) argue that "In the hotel industry, high labour turnover can result in compromised service standards, poor productivity and low morale". Labour turnover is a perpetual problem within the hotel and catering industry; Woods and Macauley (1989) maintain that on average hospitality organisations replace their entire workforce every four months! For most manufacturing/service industries, the average employee stays for 4.2 years.

3.4.3 Reasons for Organisational Change

Reyes and Kleimer (1990) refer to the "organisation purpose" as the motivating force moving, guiding and delivering the organisation to a perceived goal. The aim of organisational change is to enable hotel and catering companies to achieve enhanced levels of effectiveness within the environment in which they exist, and such aims can come from within the organisation or externally. In working within organisations involved in change, Conners (1992) has seen what distinguishes the winners from the losers. Winners are the organisations that achieve the human and technical objectives. Losers are organisations who fall short in achieving these goals. Formal organisations exist in order to achieve particular goals through the behaviour of their members. The task of management can therefore be considered to be the organisation of the behaviour of individuals and groups to achieve the desired goals in relation to the means and resources available.

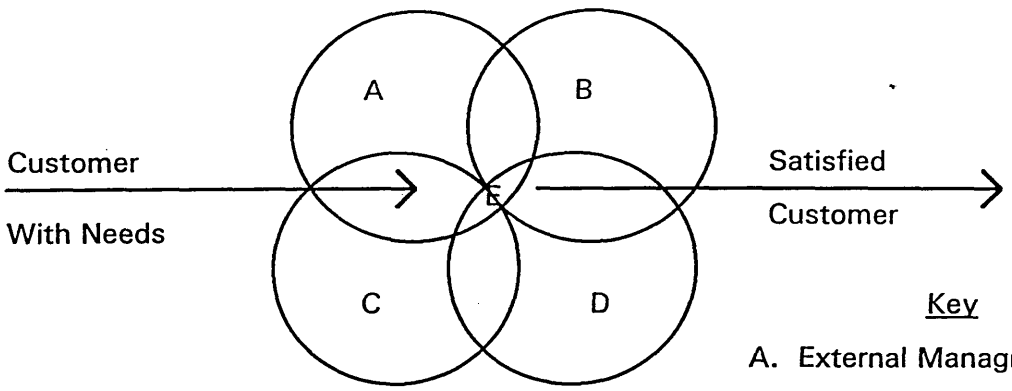
One of the key problems of management in carrying out this basic yet comprehensive task is the ability to enable organisations or employees to respond to change, and not hold on to familiar old and tired methods. As confirmed by O Toole (1985). "It is what the company does - and not necessarily what it says - that ultimately makes the difference between organisational effectiveness and ineffectiveness". Mann and Neff (1964) agree that change is needed in organisations for many reasons, including the introduction of new technology, for the development of a new product or service, or the restructuring of the organisation to make it more effective. In all cases, people will be affected. The trading of predictable and secure environments for ambiguity and uncertainty is an inevitable consequence of change.

The focus for change within the hotel and catering industry is often on technological systems of some kind, but it is important to consider the effects on the total system - in both the technical and human terms. (Pine 1987)

3.4.4 <u>Organisation Culture</u>

Hotel and Catering organisations are strongly influenced by the characteristics of the industry in which the company operates. Large and small organisations share certain cultural elements that are required for survival. The successful hotel or catering manager must ensure that the customer leaves the hotel or restaurant feeling that he or she wants to return. The rather intangible concept of 'hospitality' may be important in achieving this.

Figure 3.4.1 Model of Hotel and Catering Services



Key

A. External Managment

B. Management Information Systems

C. Human Resources

D. Technical Infrastructure

E. Hospitality Management

Source: Nailon (1982)

The diagram shows that although the hospitality element is small compared with the infrastructure of the organisation, it plays a crucial role in achieving customer satisfaction.

Successful companies are aware of their cultures and take deliberate measures to build and strengthen them, such as continually improving communications, defining explicit statements of shared values and ensuring role models are well established. For example Whitbread have proclaimed a mission statement: ..."through our obsession with service, standards and value we must meet the changing needs of the consumer ahead of competition" (Barbour 1991)

In hospitality operations, customer satisfaction relies on group based activities and the need for different departments to work closely together. It is therefore important to develop an organisational culture which encourages group motivation.

Chandrasekar and Dev (1989) confirm in the case of "the hospitality industry with the guest being the input, throughput and output, heterogeneity and unpredictability is inevitable in the organisations' work flow" The guest inflow into the system is not steady, unlike other service industries. As input materials, they are sensitive and reactive; they also have the right to withdraw from the process they participate in voluntarily. Chase (1978) refers to the hospitality industry as 'customer' initiated; an optimal balance between service system, demand and labour resources is difficult to achieve.

Research carried out by Brownell (l992) identified that to the organisation's culture and its ability to respond appropriately to change being determined by the communication practices of its management team. He suggests that today's manager is not characterised by personality or clearly defined tasks, "but rather by the response he or she is able to elicit from others". Nadler and Tushman (1990) agree that vision or charisma is not enough to sustain large-system change; this form of management style must be supported by attention to detail.

It would seem essential to recognise characteristics specific to the hotel and catering industry and how these influence staff and customer participation. Glover (1987) refers to a cult of ineffectiveness that needs to change before staff and managers become effectual. Examples of the cult of ineffectiveness include: the inconsistency of production and service which leads to hotel guests or hospital patients becoming dissatisfied with the product (meals). Staff are uncertain how to respond to the inconsistency of standards generated from poor food production and differing management styles. Some managers overlook the importance of good communication and staff training and dismiss the concept of measuring quality, and the improvements which could come from analysis of results.

The implications of this problem for the introduction of catering technology was emphasised at a hospital (Case Study 4, Section 4) where one manager attempted to develop motivation in employees by quality training programmes. He communicated the need for change to a cook-chill system both to his staff and potential customers (medical staff) with the use of seminars and videos to emphasise the benefits of catering technology without a decline in standards and the anticipated job losses. This management style could be classified as "Achievement-oriented" (Harrison 1987) referred to by Reyes and Kleimer (1990). This contrasts with another hospital (Case Study 3, Section 4) where the staff followed instructions, and no initiative was expected. Neither was there communication of what or why operations were changing. The employees here seemed bored, lacking motivation and the manager complained of a high turnover of staff. It would seem that, to achieve success, it is necessary to incorporate positive aspects of good culture practices (such as communication, training, staff participation) to create an effective organisation. Within the hotel and catering industry it is also necessary to include the customers' needs, and consumer acceptability of the meal experience within the cultural framework of the organisation.

3.4.5 Productivity and Motivation

As an industry, hotel and catering attracts many young employees who foresee their career path being developed. According to the Institute of Manpower Studies (1989) this often does not materialise. They state that within the hospitality industry "most jobs were characterised by young recruits, little training, less promotion and a high turnover of staff".

Today's workforce wants more than an opportunity to make a living, employees are better educated and more independent. They want to be involved, have an opportunity to participate, communicate and to control their own working environment. Hayes (1975) referred to by Puckett (1981).

Markowich (1971) confirms that good communication between staff and management is essential for employee motivation."The team began listening for understanding and then offering suggestions, rather than listening defensively and offering counter charges. The communications became more spontaneous, and all members began contributing". This type of interaction created a better working relationship. Staw (1986) confirms that the earliest pursuit of the happy-productive worker involved the search for a relationship between satisfaction and productivity. It would seem that productive people need to be retained. "The pool of people available just isn't there to allow us to keep pouring people in at the top and watch them fall out at the bottom" (Linstrom, 1990).

The implications of this for introducing catering technology must be that better motivation and productivity of staff can be achieved with increased participation and communication from managers. Productivity can be enhanced with a less functionally dominated and bureaucratic organisation, where employee involvement becomes important as part of the activity of placing more responsibility for work tasks and allocation on the team, together with the acquisition of a greater range of skills. "Flexibility and multi-skilling only make sense when care is taken to design the actual job that the individual as part of the team is required to do". (Mueller and Purcell, 1992).

There needs to be a change in style for motivation of staff; a suggestion by Hilton 1992) that motivation can take different forms in regard to achievements by the employee instead of targets. Sheard (1992) agrees that developing individuals to achieve, enables the organisation to obtain enhanced productivity from their staff with good communication and training offered in return. Brownell (1992) also confirms that leadership needs to be dynamic and interactive. He emphasised good communication skills to increase productivity. This seems to distinguish successful hospitality managers and leaders. It seems that hospitality organisations have three fundamental tasks to perform to increase productivity through better leadership.

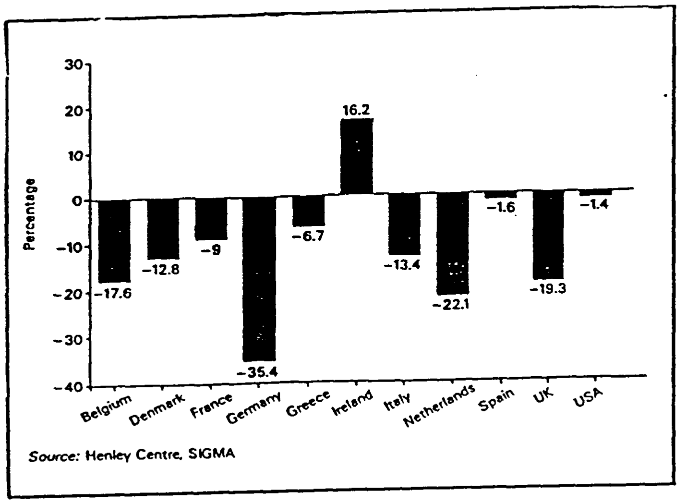
1. Managing or adjusting their internal affairs. (good recruitment and training of staff)
2. Responding to changes and demands in the external environment (customers needs and expectations)
3. Anticipating and preparing for the future (assessing their competitors and anticipated market, and better use of technology).

   Adapted from Lundberg and Woods (1990)

3.4.6 Staff Training

The hospitality industry has traditionally placed great reliance on young employees. If in the future this human resource is targeted by other manufacturing or service industries then the hospitality industry will be disadvantaged. It must be the aim of job enrichment to add such elements to a job as would, in Herzberg's (1966) terms, constitute 'motivators' - that is, provide a sense of achievement, recognition, intrinsic interest in the work itself, responsibility and advancement. With excess staff turnover (Bevan 1987) this represents a loss of skills and experience from the organisation, in terms of replacement and retraining costs. Given the facts that the UK hospitality industry currently employs three million people (Davies 1990), whom it finds increasingly difficult to retain for long periods, and that an unprecedented shortage of young labour will be apparent in the 1990's (The Henley Centre for forecasting UK 1988), it would seem imperative for the industry to develop a strategy for ensuring a continued supply of suitably trained personnel. Only by addressing the predicament from within will the hospitality industry be prepared for a radical transformation of manpower planning designed to attract and <u>retain</u> talented managers and operational staff. As figure 3.4.2 shows there will be a dramatic decline in the young population workforce throughout Europe, where no doubt manufacturing and other service industries will be attracting people of this age group by offering better salaries and training and with the hospitality industry's traditional autocratic management style it is possible this industry will be short of young trained staff.

Figure 3.4.2 Population Aged 15-24: Percentage Change 1985-95



Source: The Henley Centre (1988) SIGMA

Referred to Davis 1990

Worsfield and Jameson (1991) confirm that labour forecasts for the period to 1993 predict a dramatic increase in employment for the hospitality industry; approximately 22,500 additional jobs per annum will need to be filled. In the UK three major changes which will affect organisations can be identified.1. Population change 2. European market 3. Technological change. Berkman and Hinton (1971) maintain that 'learning' changes employee behaviour, in the sense that staff turnover decreases. Also if the employee is given the opportunity to participate in organisational change this reduces the feeling of fear and rejection, and supports self development with better training and job enrichment. For example, with 124 employees in the main production kitchen the staff turnover was 13.6% in 1969. After offering training to staff their attitude to themselves and towards their work environment changed and staff turnover dropped to 9.1% in 1970 (Berkman and Hinton 1971). Research carried out by Lockwood and Guerrier (1988) suggests that the hospitality industry is seeking a more flexible workforce who are prepared to move away from rigid job descriptions and participate in various work skills (multiskilling). They also mention that there is a deep-rooted fear within the traditional hotel and catering industry with its autocratic leadership style that managers may lose control over their staff if the employee should become more flexible.

As Watson (1991) suggests, organisations may have to delegate the authority to "front-line" employees so as to enable them to deal with customers' queries and complaints without having to clear decisions with management first. There is a need for this type of training and skill as on many occasions the manager is involved elsewhere when there is criticism from the customer. Puckett (1981) also refers to management by objectives and that appraisal and feedback to the employee is necessary as the success of the organisation depends on the individual and the collective accomplishments of the group.

It is essential that employees are informed and aware of how their job contributes to the total organisation. This can be done by a team approach to ensure quality care, using various training and evaluating methods, and possibly using an appraisal system for the employee. (Hay and Stake 1988). To achieve better operational methods of maintaining effectiveness in a contracting labour market as suggested by Teare and Brotherton (1990), managers need to look at the:

(a) redesign of job roles

(b) work schedules to improve productivity of existing staff, but this is only feasible if it does not increase present work loads.

3.4.7 Resistance to Change

Many staff feel threatened when faced with organisational change and fear of technology can cause a resistance to change with the fear that jobs may be taken over by a machine or staff feel devalued by other more experienced staff being employed to use technology. When change occurs it is for managers or supervisors to reinforce their staffs' ability by using good communication skills, (Brownell, 1990) and to implement and manage the change process, not just let is happen; this reduces employees' resistance to change. Bennis (1969) confirms that employees need repeated re-training experiences within their employment as their knowledge or present experience becomes obsolete or develops. There are other methods of allowing staff to become familiar with the prospect of change. Vyskocil - Czajkowski and Gilmore (1992) recommend that managers who work with catering staff could enhance recognition and appreciation for work achieved, and provide incentives for quality work. This encourages staff participation and motivation.

Khan and Al-Obaidy (1981) refer to Hunsicker (1978) whose findings from his survey suggest four classifications of management skills: the main overall management technique to obtain employees' co-operation for change being good communication skills.

3.4.8 Summary

It would seem that organisational change is and will continue to be an inherent aspect of hotel and catering operations. The ability to manage change while achieving the objectives of the organisation is a major responsibility and needs team leadership not an autocratic style.

In many organisations the implementation of new technology is imminent and without staff skills to use these machines to their full potential productivity may decrease. It is necessary therefore for managers to invest in better training to enable the industry to recruit and retain staff to achieve consistent standards of productivity and better quality control.

Traditional management skills would need to be assessed closely for change to progress satisfactorily as confirmed by Beard (1992) who states that traditional management responses were rejected in favour of a more flexible, participative and forward-looking approach, in which team working was encouraged.

SECTION 4

CASE STUDIES

4.0 CASE STUDIES

4.0.1 Introduction

A series of case studies has been used to illustrate the different aspects of the hotel and catering industry and to emphasise the various interrelationships of productivity and catering technology. Hotels (4 and 5 star) and large National Health Service (NHS) Hospitals offering either traditional production or on site cook-chill, and also Central Production Units (CPU) have been used to provide a representative sample of approaches. In addition two Brewery case studies have been included but are not part of the questionnaire survey as it was found this would have made the project too wide for analysis.

The case studies cover a wide geographical area from London to the Midlands and the Sheffield area. This is a reflection of managers in the industry who were prepared to give some of their time rather than a representation of good or poor establishments.

It is important to analyse productivity and catering technology within a holistic framework, unlike traditional manufacturing. This ensures that food production and service is seen in relation to the tangible and intangible aspects of the industry, for example professional and social skills that are important aspects of the industry in enabling it to develop and prosper.

Vast differences in approach to catering technology are reflected in the case studies, they also emphasise the differences in the scale of production and use and development of technology. The information provided and collected varies in quality and quantity, according to the level of information or material obtainable.

The development of cook-chill has been predominantly led by the NHS which offer a limited choice of menus, but other organisations, (such as hotels) have contributed to other aspects of catering technology with the use of specialised equipment. A lot of the information written into the case studies is not documented but extracted from conversations and semi-structured interviews with key personnel within the Hotels, Hospitals and Brewery Catering Industry. Some of the quotes are made on a non-attributable basis, and consequently names withheld. Where possible, each case study has been verified by a leading member of the hotel or hospital unit to ensure accuracy of information.

It is widely understood that catering technology cannot provide all the answers for productivity within the industry. However, within a framework of major catering industrial change, technology has a valuable part to play, by replacing un-skilled employees in a labour intensive industry, improving the general and environmental conditions for chefs and ensuring a consistent product. All of this is not possible without good communication and training for staff, to gain their acceptance of catering technology, and this acceptance will, in turn, ensure that customer reaction will be enhanced.

4.1 CASE STUDY 1 - LONDON FIVE STAR HOTEL

4.1.1 Introduction

This hotel employs 100 chefs who work a twelve-hour shift for five days, the production system is based around the traditional central island system (Figure 4.1). The majority of the staff are young, between 16-30 years. They need plenty of energy to keep up with the demands of 2000 meals per day which include the a la carte restaurant and banquets daily, from 100-500 covers at lunch and dinner service.

4.1.2 Kitchen Layout and Equipment

The kitchen, as with many others in Victorian buildings, is located in the basement - low ceiling, small, limited extraction, poor light and a cramped working environment. Corridors leading to other areas: including wash-up, still-room, pastry section and the larder. The larder is three connecting rooms - the meat section, larder preparation for terrines and made-up dishes and the fish section. There is adequate refrigeration for storage of the day's commodities. The hotel has its own butcher and poultry man. It also has two larder chefs who expertly cut and fillet varied fresh fish into the selected cuts for the day.

The equipment is of foreign make. This is a relevant point, and has been reported or observed on visits to many other kitchens. An executive chef states the viewpoint of several chefs that UK kitchen equipment generally lacks durability, and that the new French units made with 3 mm thick stainless steel are "built to last, very solid, strong and reliable".

4.1.3 Types of Equipment Used

The majority of static equipment in the production kitchen is of German make and is approximately ten years old. There are different temperature-graded ovens and solid tops graded for either slow or fast cooking. There is a grill at the end of each work area. The sous chef emphasised careful layout of the equipment for each partie section. These have relevant additions of equipment for ease and flow of work. For example:

(1) the potage and sauce section has large kettles at the far end of the area for producing fresh stock daily (no bouillon powder used) for any of the 16-20 sauces produced each day. This section also has a bain-marie to hold as many as possible of these sauces but it is necessary to have a hot stove for reheating the dishes at service. 80% of these dishes are plated, to achieve the dish presentation desired by the chef, and this also speeds up the service for the restaurant staff.

(2) The fish section is an area of increasing importance, as the chefs have found that red meat consumption has decreased. Demand is approximately equal with white meats, for example pork and chicken. Demand for the fish dishes is particularly high at lunch time as this offers a substantial but 'light', low-cholesterol meal, with a fresh appearance. The hotel bases its reputation on the freshness and excellence of its food. It was emphasised here that a combi oven would be a beneficial addition to this section for speed of cooking.

(3) On the vegetable section, there is a large boiling kettle to cook or blanch vegetables of the day, which are instantly refreshed in a cold/chilled bath before being reheated for a la carte service. It has been found that blast-chilling vegetables and shellfish after the initial cooking process and reducing the temperatures rapidly preserves the colour of the vegetables and the flavour of the shellfish. This tends to be 'ad hoc' as no probes are used to register temperature. Turned vegetables are

bought in only for banquet use, which has caused a staff reduction of two commis chefs. No doubt the hours of turning vegetables and the knife skills involved will not be missed, but it also means fewer apprentice chefs are taken on.

(4) In the roast section, mainly used for vegetables and preparation of crisps for garnishes there is a limited range of equipment - a steamer, combi oven, two fryers, with the appropriate solid top ovens for browning or glazing vegetables. Here it was stated by the sous chef that each partie section should have its own combi oven, as chefs from all sections make use of this one oven with the result that, although new, it is always breaking down. Cooking here has to be fast and efficient, and pressure of work does not allow for equipment breakdown.

The hotel kitchen also has one long hot plate that allows two services to operate at the same time, one for banquets, the other a la carte or table d'hôte. This eases congestion and is essential if there are three or four simultaneous banquets. The cooking of chargrilled foods takes place in a separate area the other side of the hotplates, for ease of service (see Figure 4.1).

The pastry section is further down in the basement. Here again there are cramped conditions. A large table area and baker's oven which looked worse for wear was found. Staff criticised the oven, although new, for its inefficiency. There are eight people in this small area, certainly not conforming with Lawson (1978) for space between equipment to allow for working and circulation of staff and air.

The main concession to technology in this area is three deep freezes, where a two-day supply of selected pastry items frequently requested by the customers is stored. Each item, as in the main production area, is decorated or finished off by hand, despite the largescale production.

4.1.4 Production System

There is a general impression of tradition, speed, skill, energy and youth (older chefs could not cope easily with the speed and aggression that is generated at service time to meet the demands of quality and professionalism that is expected by customers and management). The Chefs plate 80% of the food for the a la carte restaurant, as this speeds up the service and gives better food presentation for the customer.

A microphone is used to convey orders to each section, as no voice would be strong enough to penetrate the far corners. A computerised (Ramanco) system is used for room service and floor service so that food ordered by the customer is automatically charged to that bill. No mistakes can be made by the customer or staff, and pilfering is also eliminated.

Within the restaurant, a triplicate checking system is still used by the staff; it is explained that a computerised system is believed to take away the personal touch that the guest expects and pays for.

4.1.5 Summary

Equipment: The only concessions in this Case Study to modern equipment are the one combi oven in the production kitchen, and a Robot chef and one large bowl chopper used by three areas in the larder section. Although the existing production equipment is in good order and used correctly, pressure is created due to only having the one combi oven.

Staff: Staff are expected to work a twelve-hour shift for five days, but are paid for 40 hours. Even on top of this, unpaid overtime is expected. The tradition of 30 years ago appears to persist - that staff work for the honour of the hotel's patronage; the chef stays for a short period of time (six months/eighteen months maximum) to take the hotel's name on his Curriculum Vitae. (A Chef is an expensive commodity to lose, when a chef's training costs approximately £2000), (HCTC 1990). Although better chefs may stay and progress to partie chef/sous chef, eventually many drop out. This exacerbates the problem of staff shortage.

Another relevant factor is the reduction in numbers of apprentice chefs, as more ready-prepared foods are bought in, for example turned vegetables. This reduces trained professionals although it is and will remain a labour-intensive industry. Although cook-chill and sous vide are making inroads, many five star hotels such as this continue to uphold the bastions of tradition with conventional cuisine, labour-intensive kitchen brigades, and a measure of patronage to staff. A reliable demand from consumers can possibly sustain this, but the retaining and training of staff now needs to be a priority, to enable catering technology to be used to the chef's advantage. Although this hotel may attract chefs who are already trained, each Executive Chef has his own way of creating and presenting dishes and they prefer young chefs who can be trained in their particular style.

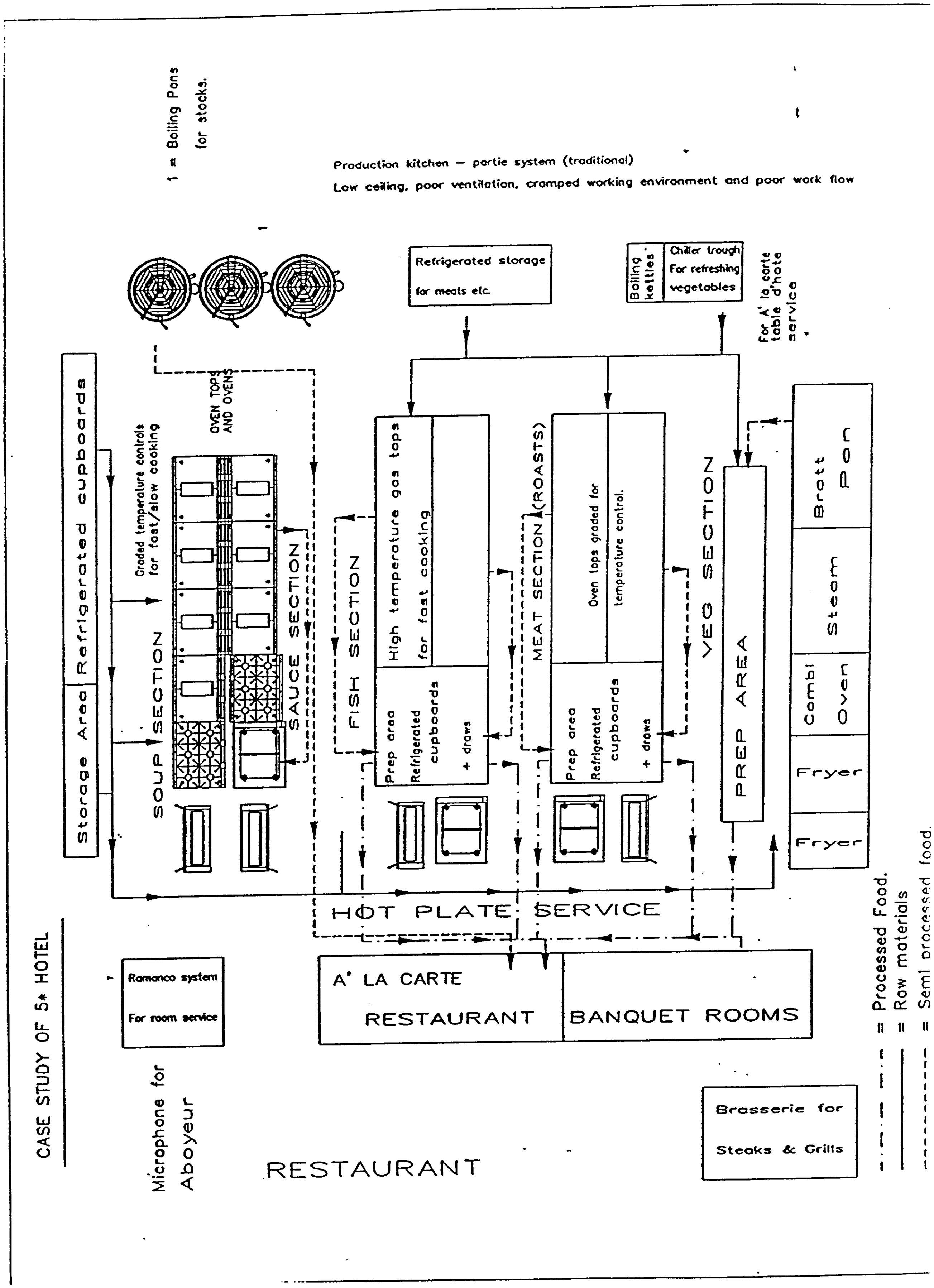


Figure 4.1 **Kitchen Plan Case Study 1**

4.2 CASE STUDY 2 - LONDON FIVE STAR HOTEL

4.2.1 Introduction

This hotel employs one hundred chefs who work a straight shift, on a salary higher than the average paid by similar five star hotels. The production system is based around the traditional central island system (Figure 4.2) but this hotel has a separate finishing kitchen for banquets and specialist restaurants unlike Case Study 1. The production areas have been separated to allow a better work environment, in that each restaurant has its own production kitchen (for example Chinese restaurant, French restaurant) which are equipped with the correct cooking apparatus for their specific needs. A point of interest is that all the equipment in the French restaurant kitchen is French-produced and operated by electricity with halogen hobs to save on energy.

4.2.2 Kitchen Equipment and Layout

For banquets, room service and the traditional a la carte restaurant, food is produced in the same modern well-equipped kitchen (see Figure 4.2).

In this food production operation, the Victorian basement kitchen has been gutted and rebuilt to the executive chef's specifications, in liaison with the architect. Walls have been removed and an open plan kitchen created with all sections of production connecting for ease of transport and movement of people. Even an escalator has been used from the ground floor to basement level to prevent unnecessary fatigue by restaurant staff.

Care in detail has been taken to make the working environment better for the employee, with air conditioning, self-clean extractor fans, light-reflecting walls and surfaces and an airy space. To add aesthetic appeal to the environment, copper pans and dried herbs/flowers are hung on the wall near the service point.

The production system has been arranged for flow of work and to prevent congestion due to restaurant staff congregating en-masse. Foreign equipment has been installed throughout except for Foster's refrigerators. Within the pastry section, Lippell mixing machines are used, three in one bank, described as multi-functional, as three food processes can be in operation at the same time on the same machine. This saves on labour time and energy, with no waiting around, thus preventing stress for the chef. Each chef (male/female) is given two weeks induction training on each piece of equipment used in the production area. Within their induction period, two hours is spent on required hygiene procedures, though hygiene training is ongoing and reinforced by the executive chef. Staff and equipment look spotless, except for the Blodgett ovens, six months old, which appear well used. The German and Swiss equipment look as if they have just been unpacked.

4.2.2.i Pastry Section Two Sweba ovens are used, both computerised, giving good results. Again this reduces the stress on the staff, who otherwise may wonder if the oven is generating too much heat or, if distracted, may allow the product to be browned or burnt. With a computerised system, staff are free to concentrate on the next task.

4.2.2.ii Larder Section This is an enclosed low temperature maintained area. There is a refrigeration "chiller" where meats and vegetables can be cooked or par-cooked and then rapidly chilled; with the use of a probe to ascertain correct temperature, the item can be chilled to 3^{oC}, and the correct temperature will register on the exterior of the refrigerator and will be held for 1 - 12 hours until the commodity is required. Meats are also cooked and vacuum-packed if they are not to be used for that day's consumption, to prevent flavour - and weight-loss, and also chilled to 3^{oC}.

With banquet service, some food, mainly bulk items, for example vegetables, sauces, sirloin joints, will be blast-chilled and stored at 3^{oC} and held.

4.2.2.iii <u>Finishing Kitchen</u> Fish or fish steaks are cooked on the day of consumption in the finishing kitchen, which is well-equipped with modern technology (for example combi ovens and bratt pans). Hot holding trolleys are used for transportation between floors - thus eliminating the long dash by the restaurant staff, and the food then flashed under the grill before service. Restaurant staff remain at the hot cupboard and the food passed to them is piping hot at 68^{oC}.

Visual displays of dish presentation are kept on hand for new members of the team. Every day a specimen dish is displayed (for example glazed escalope of sea bass with wild mushrooms) for staff to understand the sous chef's expectation of presentation, thus eliminating the need to return the food to the commis chef if wrongly presented. Training and time is given to staff on this.

With banquet service, the finishing kitchen is either used as the name implies, or as the area for the full production system, with the help of a bratt pan for sealing meats and shallow frying of food. Two combi ovens ("excellent equipment" the partie chef stated) are used, one for fish dishes, the other for meats. These are not interchanged, for no matter how well cleaned they are, the aroma of fish lingers.

Meat or fish is par-cooked in the combi ovens either in the basement kitchen or finishing kitchen; with the use of the probe and the computerised temperature control. Food is then held until the final burst of heat is used to bring it up to temperature or final cooking, 68^{oC}. It takes five minutes for the oven to increase the meat temperature from 48^{oC} to 65^{oC}; this time is then allocated to the timing schedule for the start of the banquet. The chefs are aware of this and can adjust the cooking process accordingly. This is an effective way of ensuring that the food is hot and not over-cooked, (which can happen when the guests are late in sitting down to the meal, and the food has been held hot in a conventional oven or hot cupboard). This again reduces the stress and strain on the chefs, who do not like serving overcooked food to 500 guests, who may go away dissatisfied with the meal, leaving the chef knowing they will take their custom elsewhere. Chef job satisfaction here is high, since they know they can consistently deliver good quality.

4.2.3 Summary

From the observations here, it is clear that, in comparison to the traditional partie system, space and equipment have made the chefs' environment significantly better. Attitudes to work and professionalism have improved. As one chef stated: "It is important for staff to be treated as people with ideas to be offered and for staff to be given the opportunity to progress, with training and extra skills". It has been shown here that staff involvement prevents the high turnover of staff prevalent in the Hotel and Catering industry; staff are shown their worth, not simply treated as a number, and each individual is assessed for capabilities and strengths.

This reflects the changing attitudes of staff, who are now less prepared to work in a poor environment but seek job satisfaction and recognition for progression. It is no longer a case of "waiting for dead men's shoes" as in the past and the industry must seek out staff and retain them, or standards will fall. If not they may have to look at other alternatives such as a fully standardised production system. Recognition of and attention to staff needs may be considered a better option, to maintain individuality and consumer recognition.

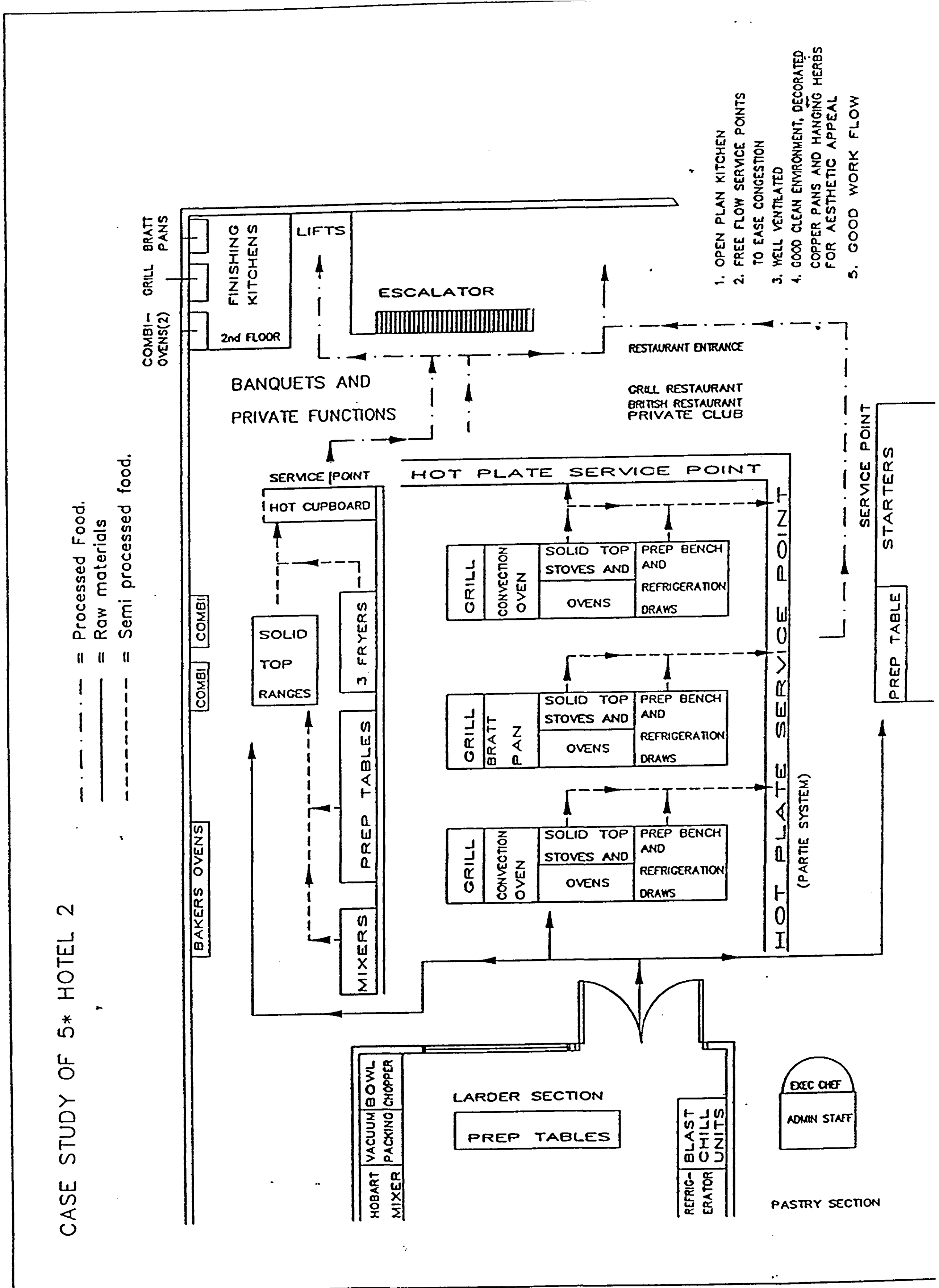


Figure 4.2 **Kitchen Plan Case Study 2**

4.3 ANALYSIS OF CASE STUDIES 1 & 2 - 5 STAR HOTELS

Both five star Hotels are traditional in their attitude to menu planning and food production, with all food items being brought in fresh and prepared and cooked within their production kitchens.

Although the executive chef's approach to preparation and cooking techniques may vary, they both achieve excellent professional standards.

4.3.1 Case Study 1

Here the kitchen is located in the basement area, and produces a similar number of meals to Case Study 2. All meals are produced in one production area, without separate kitchens for specialist restaurants. Nor are there finishing kitchens for the banquet rooms. Undue pressure is exerted on the production staff within one small area of production, as they need to plate each meal for the main restaurant as in "nouvelle cuisine". Banquet service is served from the other end ot the hotplate (see Figure 4.1). This causes congestion during service times, and greater use of the one combi oven placed near this area.

There are no visual aids to show new staff the correct presentation of meals. Also, the ventilation system is poor, adding to staff fatigue. The number of apprentice chefs has been reduced by two by buying in turned vegetables for banquet use; this has an adverse effect on the ladder of progression, as young staff are not being trained, and there are no ready replacements when staff leave.

4.3.2 Case Study 2

The production kitchen again is in the basement, but has been converted from small rooms to a well-ventilated, open-plan area, offering a pleasant aesthetic environment for the staff. Island production systems are used for the main restaurant (as in Case Study 1) but there are areas specifically utilised for batch cooking for banquet purposes. The foods produced here are then transported in mobile hot cupboards to the finishing kitchen for banquet service. This alleviates the congestion of staff in one hot plate area . Self-contained modern kitchens are also maintained for the specialist restaurants, thereby offering a greater choice of service to the staff and customer. All production areas have the benefit of modern versatile catering equipment, such as induction hobs, combi ovens. Some items of food are produced, then vacuum-packed and kept within the storage capacity of 3^{oC} for up to 12 hours. This system is mainly used for banquet production menus.

Visual aids (for example photographs) are used to show correct food presentation, to allow new staff to be better equipped for food preparation and service. New staff are given an induction programme at the outset, which covers every area of work.

From the two contrasting case studies it is clear that training for staff and a good working environment must become vital considerations for the Hotel industry. A more effective staff, with a smaller turnover, can be achieved by ensuring more attention is given to kitchen design and planning, and the provision and use (with appropriate training) of modern catering technology. The difference in working conditions and staff attitude and morale was quite marked and demonstrates the improvements that can be made with progressive design expertise and investment.

4.4 INTERVIEW WITH MR JOHN REID - REGIONAL CATERING ADVISER FOR THE WEST MIDLANDS NATIONAL HEALTH SERVICE

This interview covers reasons for changing from the conventional catering production system (ie trolley service) to cook-chill. Mr John Reid claims that a cook-chill production system has been found to be an improvement on traditional production trolley service.

4.4.1 Production System.

A greater emphasis is placed on technology and quality control under the cook-chill production system. The food produced is maintained at a chilled temperature of 3^{oC}. The food service can be implemented on the "Ganymede" conveyor belt system, whereby catering staff plate up the meals as requested (from containers holding approx. 18 portions) which are then conveyed to the wards in a chilled state within a regethermic trolley. Forty minutes regeneration time is allowed to obtain quality control and to achieve a hot hold temperature of 70^{oC} for two minutes, before service.

4.4.2 Staffing Structure and Staff Training

In the view of the Regional Catering Adviser, the cook-chill operation has not been found to be labour-saving as far as numbers of staff go: skilled staff have been reduced, but extra semi-skilled staff have been employed, and there has therefore been a beneficial saving on overall labour costs. Staff are concentrated in one area, operating an eight hour shift and producing food to a high consistent standard. Problems of shift duty are alleviated, with no weekend or night shifts. This again saves on staff costs, as the hospital in question (Redditch) has a three-day storage capacity to serve meals to patients and staff over the weekend. A vending operation for staff meals for night duty is used. Food is kept at the required temperature, 3^{oC} and regenerated in the Microwave oven by the purchaser, thus eliminating the need for night catering staff.

4.4.3 Quality Control

Staff have to be trained and informed to carry out activities such as reading temperature controls, setting the machines to chill or blast freeze; correct storage procedures and stock rotation. Staff must also keep within their own boundaries of food preparation, for example larder separated from salad section to prevent cross-contamination of food. Colour-coded equipment is used, so that saucepans and trays used by the larder section are not used by the vegetable section. Rotation of staff from area to area is essential to stop boredom from repetition of work.

It has been shown that the same number of ingredients and preparation time will be used by the staff for food production, as in traditional production system. Better quality commodities have to be used to maintain standards and prevent food contamination and deterioration, and to keep food wastage to a minimum. Unlike five star hotels, menus are limited and economical to conform to price and skills of staff.

The achievement of prime quality starts with the wholesaler, from whom a consistent 'quality' product is bought, as prime quality is important for portion control. Regional contracts are drawn up to obtain a better buy from the wholesalers and to assess quality through strict specifications for food items and yield. From better produce more portions will be obtained, through less preparation waste (for example less sinew and muscle fibre.) For all cook-chill systems in the NHS, produce specifications have been set up through the Meat and Livestock Commission and Dairy and Fish authorities. Quality testing of canned goods consists of looking at the number of items in the tin, density of syrup for fruit items, colour, taste and appearance. working within a tight budget, a 'bad buy' cannot be afforded.

The production manager and the catering manager can be the same person, but he/she may have supervisors who will monitor the standards being achieved. Food has to be monitored, dehydration with chilling and the regeneration of the food has to be continually assessed, as there is a time limitation on the foods chilled (five days maximum.) Probes are used throughout the production system.

Modification to menus and food preservation procedures are also required. The depth of food is important, 50 mm maximum to allow correct chilling of the food. Battered fish will end up soggy if the correct formula for the fish is not adhered to. Other foods have to be modified, for example stabilisers for soups, powdered soups mixed with cold water, not hot water: simple techniques that staff have to be made aware of to obtain a good emulsion with flavour to be served 'hot' as a soup.

Many benefits have been picked up along the way with cook-chill catering. These include the use of bran to improve the texture of pastry; chilling some items with the lid on to prevent 'freezer burn'; the correct level to prevent spillage of liquid. Each product used within the system is tested first in the quality kitchen by a development chef, with yield testing one portion to full bulk capacity. In many instances bulk regeneration has proved better than plate regeneration, providing better heating without drying out around the edges.

4.4.4 Recipe Control

Recipe control is obtained by standardised recipes worked out by the chefs. The managers have found that staff involvement with recipe development is crucial for a good end product, as the staff show more interest in their work, and wish to achieve high standards and are more critical of the food produced. There is no space in this operation to carry 'cowboys'; standards have to be maintained. Some individuals cannot cope with the restrictions of recipe cards and have to leave, as every dish is costed accurately, and an extra pinch of fresh herbs or an extra 25 gm of meat will add cost to the end product, and there is no flexibility in a rigid budget. Every ingredient has to be weighed for each dish, and therefore staff participation is an essential management tool. One lesson learned from within many NHS catering cook-chill operations is that a master recipe book should be developed from all institutions to prevent every new system 'reinventing the wheel' for recipe development.

4.4.5 Catering Technology in Use.

One advantage for the cook-chill system is that in many hospitals the original cooking equipment can be employed, and the present staff. The main new expenditure is on blast chillers, refrigeration, storage and trolleys for food regeneration and transportation, plus all the gastronomes for cooking the food and chilling the food within the same containers.

The work flow is organised so that for batch cooking less equipment can be used, as long as it is heavy duty. For example two bratt pans instead of four. Experience has shown that staff become tired if they have to move along a bank of equipment (six bratt pans without modern temperature control) but this was a learning experience necessary in the initial stages of operation. A bank of new pressurised bratt pans was therefore purchased to alleviate this production problem. Now, with high pressurised steamers, fryers and convection ovens, the production line of food can be maintained, with fewer items of equipment.

4.4.6 Points of Emphasis

The emphasis has to be on quality, of food as well as of equipment; the cook-chill process will not make 'poor' quality food better for the consumer. Produce must be of initially good quality, maintained by the chefs during the cooking process and cooked items then stored at an optimum level. It is also clear that the need for staff training is paramount; this has to be ongoing, allowing unskilled and semi-skilled employees to progress to skilled staff status by in-house training, day release or block release courses, especially in hygiene, and courses for particular skills. for example City & Guilds 706/2.

4.5 CASE STUDY 3 - NATIONAL HEALTH SERVICE BIRMINGHAM (QUEEN ELIZABETH HOSPITAL)

4.5.1 Introduction

The production system is based around a large unplanned kitchen (see Figure 4.5) that follows the traditional hospital catering operation of bulk production cook and serve.

4.5.2 Conventional Catering: (trolley service).

This hospital catering operation is run by a team consisting of approximately 100 staff. The present trend within the NHS - that every patient service has to be cost effective - is adhered to within the budget, and efforts are made to generate other income from functions etc. But this is maintained with great difficulty, with the constraints of out-dated catering equipment and a vast amount of kitchen space where staff have to walk long distances to prepare, produce and serve the food that has to be kept at a steady temperature during the hot holding session of ganymede service to reach the patient in an acceptable form at 68^{oC}.

4.5.3 Kitchen Equipment and Layout

This particular hospital was built in 1936, a monument to pre-war architecture, and to the benefactor of the day.

The main production kitchen for the 28 wards is found in the basement, a vaulted room which stretches in all directions to encompass the special diet kitchen, storage room, and general stores and four walk-in cold rooms with metal tier shelving. These are used to separate items for example cooked and raw foods, dairy produce and vegetables. Stock control is monitored, but pilfering is difficult to control, due to the space and walking distance between each fridge. Open access is maintained.

The kitchen equipment is situated along each wall except for the steamers and boilers which are placed at right angles to each bank of equipment; the rest of the equipment appears to have been dropped into place within this arena. The equipment dates back to pre-1950's in some respects; the only concession to modern equipment is the two pressureless steamers with timers used to cook frozen vegetables in batch lots for service with excellent results, i.e. the colour and taste is retained during service time. The equipment consists of a bank of four Benham steamers (operated by a traditional steam boiler) used to cook gammons and steam puddings. On the opposite wall from the steamers is a bank of baking ovens (Thomas Collins), and although this equipment is no longer produced, a local company have taken on the task of repair when necessary. Items such as fish fingers, beefburgers, sausages are baked; it is difficult to cook so many under a grill or in a bratt pan for service time. One mixing machine (Peerless) stands against the wall, towering 2 m in height, but can only operate at one function, for example whisking, at a time, unlike modern machines where the operator can use three processes simultaneously (which would reduce waiting time for staff and speed up food preparation). Stotts Super Grills are in the centre of the kitchen and away from the boiling kettles. The bratt pan is placed against one wall with three deep fat fryers against another wall. All the equipment is clean and in working order.

The majority of the equipment here has no thermostats and temperature control is assessed by trial and error, until the chefs learn the quirks of the equipment and experience tells them how to set the dials to prevent burnt produce. There are no computerised equipment or probes set in ovens to assess "doneness". Experience based on trial and error prevails. Whilst this technique can work, it only adds stress to the pressure of work felt by the catering staff who wish to achieve a high standard of output for the patients and staff, but who have to deal with antiquated equipment (see Figure 4.5).

4.5.4 Production System.

Staff here are producing 15,000 meals per week (approximately 550 beds for patients, plus staff meals). In this large teaching hospital, there are many people to cater for, all with their own specific needs. The patients' dietary requirements are varied and complex, with the addition of ethnic meals, all of which are produced for individuals at a prescribed time. A great deal of effort is needed to keep this production streamlined and to a high standard, especially with staff shortages and a tight budget of £12.50 per head per week. This is assessed on a sliding scale:

£11.25 - geriatric patients

£12.00 - general

£12.50 - teaching and specialist patients (for example renal dialysis patients, where the food has to be purchased sterilised to prevent risk of contamination.)

From this amount per week per patient, the catering manager has to produce three meals per day, plus morning, afternoon and evening beverages. When the Hospital catering went out to private tender, the private company withdrew after nine months, stating they could not operate the production system within such constraints.

4.5.5 Food Service

The food is bulk cooked and plated by the catering staff with the aid of one ganymede conveyor system. The metal base that holds the plate is heated to 98^{oC} and the plate is also heated; the food is (piping) hot, served from hot cupboards. Probes are used to monitor the food temperature. The heated base is designed to keep the food hot for 40 minutes from the time of plating to consumption. The caterer hopes that no mishaps will occur en route to the wards. Five hundred meals per hour are plated, which is hard work when this is calculated at ten plates per minute, (the average is usually four). Medical staff dictate that patients all need meals within an allotted time, between 12 noon and 1 p.m., to fit in with medical rounds and visiting times. (This may be one factor in the overall patients' plate-waste of approximately 23%)

4.5.6 Staffing

Within the catering operation, 105 staff are employed, 80 of these are full-time. The chefs are skilled, earning approximately £130 per week over 39 hours. More than 50% had already taken the NHS Hygiene Certificate to conform with the possibility of Government legislation (two hours a week training over three to four weeks, with a written test). This training process is ongoing and monitored by the Catering Manager. The catering staff are on two sites, one for patients, the other for staff catering. This is the main reason for employing so many staff, as with a road between the wards and the staff restaurant, food transportation would be difficult.

4.5.7 Staff Food Production

Behind the cafeteria the kitchen is clean, but again vast, with old and outdated equipment spread out along the walls and four gas solid top stoves in the centre of the kitchen. In 1936 kitchen planning did not consider in any sophisticated way the flow of work and staff at that time were in plentiful supply and cheap to employ. Today staff suffer with fatigue from the amount of walking required.

4.5.8 Staff Food Service

The staff restaurant has recently been refurbished with a brand-new free-flow system for food service. All hot and cold cabinets are thermostatically controlled; salads and sandwiches are kept at 5^{oC} within a cold air circulation cabinet. All items are wrapped. (It has been found that the sandwich-wrapping procedure can be inadequate, this has been overcome by chilling all items before making, and then chilling the sandwiches when packed before service - otherwise the plastic wrapping registers $+05^{oC}$, but the contents could be as high as $+18^{oC}$ when opened). Possibly a factor to obtain a preparation room with an ambient temperature of 10^{oC}. The hot cupboards are monitored by probes to ascertain that 68^{oC} is achieved; overhead, infrared lamps help to keep a steady temperature.

Choice of food is varied and the staff's average spend is £1. Sandwiches and snacks have replaced a heavy mid-day meal for many customers.

4.5.9 Summary

It would seem that in the long-term one answer to the catering operation would be a Central Production Unit (C.P.U.) purpose-built on the Queen Elizabeth site, as there is sufficient land. It may be wasteful exercise to put money into the present traditional operation, as the area is huge and staffing two sites is labour-intensive and expensive. Each kitchen needs to be refurbished. A token gesture of combi ovens would be welcome, and could be incorporated into the new kitchen. However, when resources are low, no doubt a new ward trolley takes priority, or even shelving for the stores. Staff work, but appear to have little enthusiasm or interest, and have poor status. A good working environment would be desirable to retain staff as Birmingham is expanding commercially and there is competition for staff from other industries. However the only way the Catering Manager can obtain repairs or replacements is as a result of environment Health Officer demands. Lifting of crown immunity has been a great asset to Queen Elizabeth Hospital catering, but the future looks bleak in terms of more fundamental refurbishment.

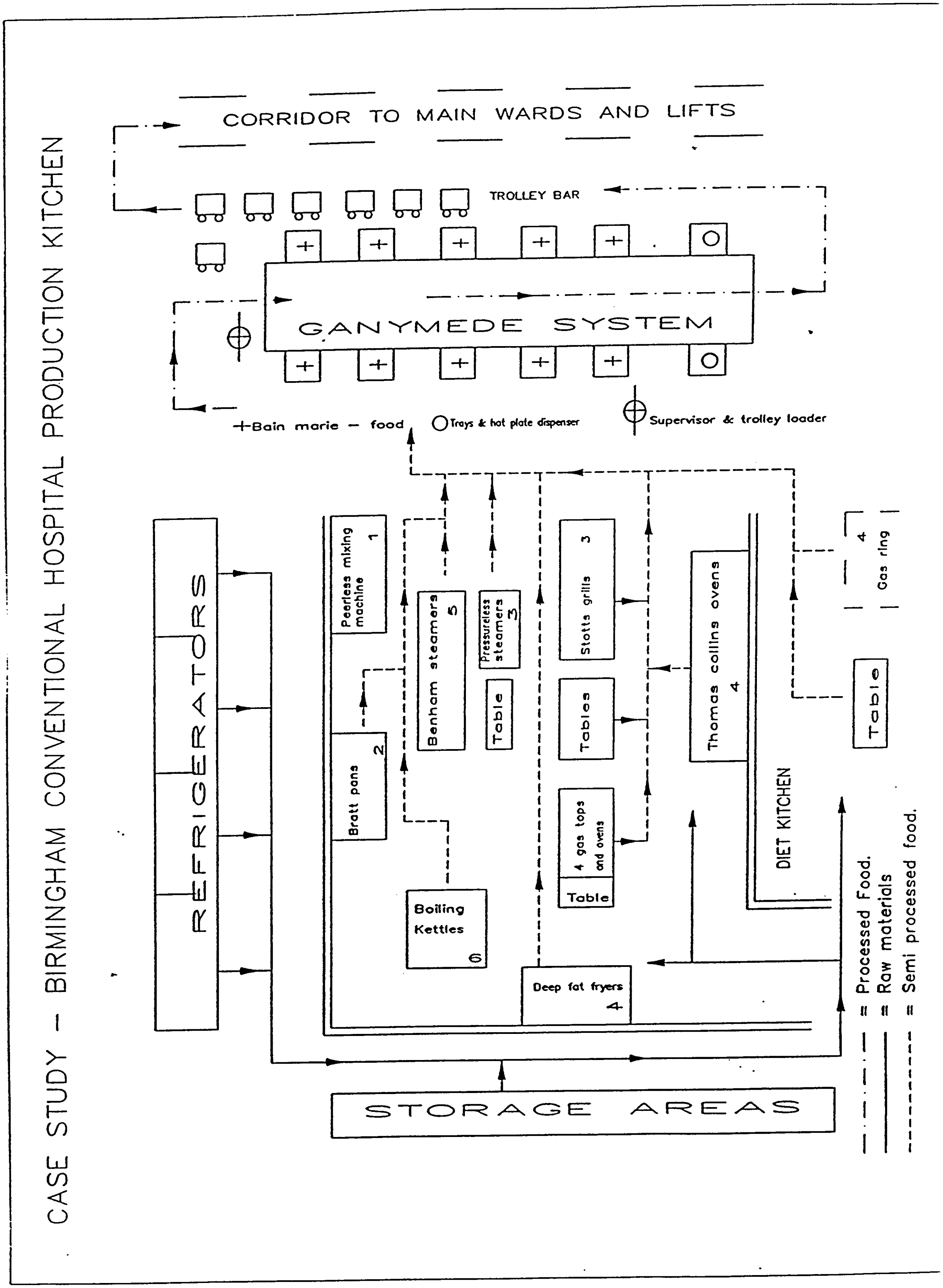


Figure 4.3 . Kitchen Plan for Queen Elizabeth Hospital Birmingham

4.6 CASE STUDY 4 - NATIONAL HEALTH SERVICE REDDITCH (QUEEN ALEXANDRA HOSPITAL)

4.6.1 Introduction - Cook-chill - Regeneration Service

The hospital catering production is centred around a cook-chill operation that has been installed within a traiditonal designed catering system. This operation is cited by the Regional Catering Adviser as a prime example of a well managed highly cost-effective operation. Over the six years the cook-chill system has been in operation, the catering team have achieved substantial recognition as a professional catering operation. The present catering manager has further developed the cook-chill system to include supply of four other hospital/welfare units. It has also taken over the Medical Undergraduate Unit from private catering. Function catering now includes repeat business, offered at competitive prices and helping justify the investment in the cook-chill production system. This achievement is largely due to the management skills and enthusiasm of the present catering manager.

4.6.2 Kitchen Layout and Equipment

The main production kitchen for all the catering is found on the ground floor, situated behind the hospital. It shares access with two other units, (the estate office and the medical laboratories) which causes congestion when wholesale deliveries arrive together. As the catering unit has chilled items delivered, such as meat, that have to be maintained at 5^{oC} from the vehicle to the cold room, it is important that these receive priority. All food items enter from the rear of the kitchen and are placed in the appropriate chiller. The stock is stored and used in rotation. Vegetable items are purchased ready-prepared. For example potatoes are graded by size to be boiled whole without being cut, or ready-diced for potato salad or meat and potato pie, at the appropriate size. Roast meats are bought to pre-cut sizes of approximately 2-3 kgs, or processed to required specification.

Effective use is made of visual signs for staff. For example, cross-contamination in the meat preparation area is controlled by staff not being allowed into the larder section if the chef there is wearing a red apron. Equipment is colour coded for all areas, enabling staff to match equipment to section at a glance pastry (yellow), larder (green) or production areas (white);) there is a wall-chart colour-key for new staff.

All large chillers are monitored by thermostats located on the outside wall of each refrigerator; if there is a temperature increase while the kitchen is not in use, alarm bells ring automatically at the switchboard and appropriate people are called. Smaller mobile refrigerators have their temperature monitored three times daily and the temperature chart is signed by the appropriate staff, conforming with the requirements of the 1990 Food Safety Act.

The pastry section is at the back of the kitchen for coolness. It is self-contained with two convection ovens (10 grids) and the Hobart mixers needed for certain food preparation. Within the production area of approximately 6 metres x 10 metres, which includes the pastry section, are: 3 convection ovens (10 grids), 3 pressure steamers, 2 double atmospheric steamers, 5 boiling kettles, 3 fryers, 2 bratt pans (1 gas, 1 electric, in case of power failure) 2 grills, 2 solid tops.

Adjacent rooms are for the larder, cold rooms and pan wash. There is also a sandwich/salad preparation room which is maintained at 6^{oC} - 8^{oC} maximum.

4.6.3 Production System

Although subject to relative recent investment, the main production kitchen has an inadequate ventilation system. Whilst there are extractors above every apparatus the temperature is still 90°f, even on a cool day. This provides a poor working environment for the staff (see Figure 4.6).

Food is batch-cooked, placed in the appropriate gastronome container (approximately 21 portions) for portion-control and ease of service, and then chilled (see also "Food Service", 4.6.4).

As in any food operation, reliability and efficiency of equipment is important. The majority of equipment here is six years old and increasingly problems are occurring. One atmospheric steamer went out of use in February 1992, returned in June 1992 and again broke down ten days later. With heavy use, catering equipment frequently has a life of possibly six years. Convection ovens have micro-switches triggered by the door handles; the handles now have to be tied together for the apparatus to work and generate heat. Although there are two bratt pans, staff prefer to use the gas appliance as this has better temperature control. This machine is mainly used for shallow frying or colouring/sealing meats. The three fryers are little used. Fried items, such as battered fish and chips, are brought in as convenience items and cooked in the oven. This is less time-consuming for the staff and a good colour is obtained for the product. It also saves on frying oil, dispenses with the smell of fried food, and ensures a more consistent product.

In total patients' dietary requirements, including special diets, amount to approximately 30 different dishes on one food service. This is allocated from a budget of £1.71 per day per patient, which covers three meals and six hot drinks a day.

Production waste has been analysed at 6% per year, plate waste 13% per year, in contrast to a national average of 35% plate waste. (Queen Elizabeth Hospital in Birmingham (Case Study 1, NHS) assessed their plate waste at 23% per year).

It would seem that, with efficient purchasing techniques and portion control, a cook-chill operation offers greater savings. This has been monitored in this particular hospital, with a budget of £210,000 for patient meals, with only a £130 overspend on total patient provisions, compared to others within the district offering traditional production systems who have a greater overspend.

4.6.4 Food Service

Food is batch-cooked and placed in containers holding 21 portions, after which it is chilled to +3^{oC} within 90 minutes. Temperatures are monitored at four stages of the process. From the time the item is placed in the storage container at 90^{oC} to the time the food is wheeled into the chiller at 73^{oC} (no more than half an hour later) a temperature reading is monitored to assess speed of delivery from one process to another and to maintain staff vigilance for food safety. The food, once chilled to 3^{oC}, is then placed within chilled storage chambers and colour-coded for each day of the week, the type of dish and the meal required.

On the relevant day, items are loaded on to the chilled service trolleys and staff plate the meals required. This is on a Ganymede system, and cold air is filtered on to the conveyor belt at a constant temperature of 6^{oC}. Within the area of the food handlers, the air is maintained at 12^{oC} and the outer periphery of the room is 14^{oC}. Food is plated for good presentation, and the staff are speedy, with 415 meals being plated in 45 minutes - (approximately one meal plated within six to ten seconds). The plated meal is placed on a tray and set within the mobile regethermic trolley.

At the ward, a member of the catering team takes a temperature reading of the protein items with a probe, which should record a temperature of no more than 10°C. If this is correct, the trolleys are switched on to reach a food temperature of 72°C within 35-40 minutes. This temperature must be maintained for two minutes. At this temperature listeria and salmonella are assessed to be destroyed and the food is ready for the patients to consume. If the temperature should reach 80°C, drying and scorching of the food arises and poor presentation then occurs, to the patients' dissatisfaction. All dirty crockery is returned to the wash-up area, where approximately 9,000 items are washed and stacked.

4.6.5 Food Monitoring

Every cooked/raw item is assessed periodically by the Environmental Health Officer (water is now classed as a food, and this is systematically tested at a minimum of once a year). Plate waste generally occurs when the patient is not present at meal times (in surgery or undergoing treatment). This adds an extra burden to the caterer's cost, with no recompense, even though the nursing staff are allocated £30,000 per year as part of their budget for plating of meals.

4.6.6 Staffing

Kitchen staff work straight shifts of 7.00 a.m. - 3.30 p.m. or 8.00 a.m. - 4.30 p.m. with 9 full-time chefs (39 hours per week) and 2 part-time staff (25 hours per week). This includes 4 supervisors working over a 5-day week. 2 chefs work at week-ends to reheat the meals correctly. 2 kitchen porters work over the week-ends to deep clean the kitchen, especially the ventilation system. 80% of the staff have already taken the NHS Hygiene Certificate to conform with Government legislation. In addition, trainee E.H.O.s observe the cook-chill production system as a training area to assess the flow of work and to monitor hygiene practices. Feedback from these sessions enables the catering manager to be vigilant with production techniques, and prevents staff becoming complacent.

4.6.7 Staff food service

Staff receive a different menu from the patients. This prevents menu fatigue for the catering staff and ensures that nursing staff do not associate ward meals with their own. A wide choice is offered daily, with presentation a priority. Eye appeal and the freshness of food is of a high standard. Sandwiches are made daily within the preparation room and individually wrapped. Plated salads are wrapped and sold separately from the protein item. A choice of vegetarian dishes is also offered under the banner of healthy eating, and calorie counts are typed on to many menu labels for the customers' benefit (although chips are still offered and in great demand).

All cold items are kept at 5^{oC} within chilled cabinets. Hot food is monitored with probes and there are digital readings on both hot and cold cabinets. One-third of the 1,000 hospital staff use the catering facilities, which is a good percentage. An average spend of £1.60 is expected at lunch time, but high sales of confectionery items are recorded throughout the day. The sales mix is good and overhead recovery is calculated at 20% - 25% of the cost price (i.e. for each £1 spent on food, the caterer needs to recover £1.25 from the customer.

4.6.8 Summary

This cook-chill production system has been in use for six years. The main problem has arisen from the conversion of the kitchen from the original traditional system. This is evident in the layout of the equipment and the difficulty in achieving a good flow of work. Every food item is presently manhandled, for example food from the boiling kettle into the gastronom for chilling or from the oven and then into a container. With modern technology, especially combi ovens, the whole rack of food could be removed and then placed directly into the chiller without being first lifted out and placed onto trolleys for wheeling. This would produce a saving on labour and energy.

Nevertheless staff are diligent and enthusiastic about the system, as it allows them to work straight shifts. Although in a busy environment, they seem to be more in control as they are not producing food for that day's use. This removes some of the pressure associated with traditional catering, with its peaks and troughs of service.

The catering manager emphasised the importance of good communication for staff morale, a team approach to problem-solving in the use of production scheduling, and the monitoring of cooked foods throughout the cooking and chilling process. This enables him to maintain budgetary control and achieve a high-quality overall catering product. It would seem as used here better public relations are needed to project cook-chill to gain the public's acceptance. After all, the majority of the public use this method within their own homes when buying chilled produce from supermarkets.

For good practice, as was evident at the Redditch hospital, quality control must be maintained at all times from purchase specifications, storage, to the finished cooked item. Good staff training is also imperative. The main disadvantage found at this operation was the hot atmosphere that the food was kept in between cooking to chilling. This can be compared with the Central Production Unit at Burton upon Trent (Case Study 5), where the kitchen environment maintained a cooler, air-conditioned temperature.

If modern catering equipment were purchased, a decrease of approximately 40% of the present number of items of catering equipment could be possible. This would allow better work flow and a larger preparation area, easing staff congestion and create an improved work environment.

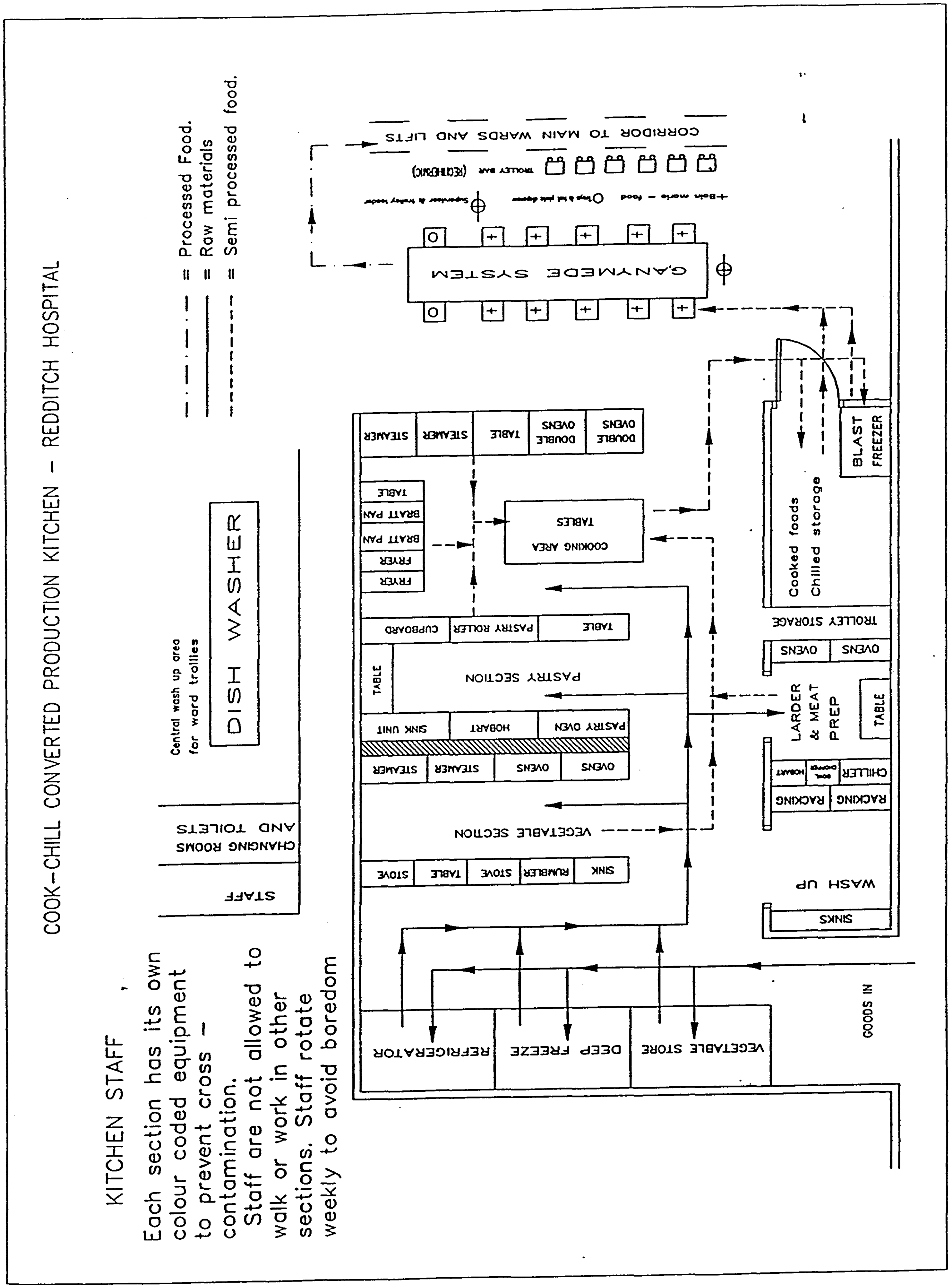


Figure 4.4 Kitchen Plan - Queen Alexandra (Redditch) Hospital

4.7 ANALYSIS OF CASE STUDIES 3 & 4 - HOSPITALS

The catering production systems of the two hospitals, Birmingham and Redditch, have been observed, from the preparation of the food through to the service for patients and staff. Both use the Ganymede system to plate meals for the patients, but this is the only similarity.

4.7.1 Case Study 3: Birmingham

In the Birmingham hospital, the kitchen is old and difficult to maintain. Catering equipment is antiquated, except for the bratt pan and pressureless steamers. As a unit, it produces similar numbers and types of meals per week as Redditch, but it employs more catering staff. This is necessitated by the large expanse of the kitchen and storage areas and because in Birmingham the food is produced under the traditional production system, i.e. breakfast, lunch and dinner meals are prepared, cooked and served on the day of production. This is time-consuming and labour-intensive, compared to Redditch's cook-chill system. Staff fatigue is exacerbated by the amount of walking that is necessary from one area to another, with little thought given to 'work flow'. This has been inherited from the 1930's kitchen planning, when staff were plentiful and labour cost minimal. To alleviate this problem and to move equipment closer together would be expensive, and drainage and fuel supplies would be difficult to re-site if the equipment were moved nearer to the Ganymede system.

To improve matters specialist equipment could be purchased, for example combi ovens, further steamers, pressurised bratt pans. This would reduce the number of foods that are baked. It was found that some items of food are fully cooked at 9.30 a.m. for food service at 11.30 am., in order to keep up with the demand once the Ganymede plating system starts. It is difficult to maintain food at 68^{oC} without it drying out over this period of time. This method also brings into question the validity of the maximum of three hours hot-holding required by the 1990 Food Safety Act, as well as the nutritional value of the meals served.

Overall, the production system works mainly by the vocational professionalism of the catering staff, and their interest in maintaining standards. In comparison with the cook-chill operation in use at Redditch, the catering staff at Birmingham have a difficult, demanding and discouraging job.

4.7.2 Case Study 4: Redditch

Redditch converted its traditional production kitchen to a cook-chill system, owing to the cost and difficulty of attracting and retaining catering staff. After preliminary research, it was concluded that money could be saved with better quality control over food purchasing, and by developing recipes to achieve better portion control. The planners optimised on the original catering equipment, and re-planned the production kitchen to keep each area separate, to prevent cross-contamination of food. A strict hygiene practice is adhered to, by ensuring that staff are restricted to their own preparation and cooking areas, without crossing into other zones and that non-kitchen staff are excluded from the area. The catering equipment is not new, but the planners considered work-flow and the benefits to the staff, in preventing fatigue and increasing speed of production.

Staff have approved of the benefits of reorganisation and de-skilling has not taken place, although fewer staff are now employed. There are training programmes for each preparation/cooking section, and staff rotate from one area to another to reduce boredom. With new technology and skills to be mastered this helps to generate a better working environment and improves staff attitudes and motivation. Staff are involved by Management in decision-making in regular staff meetings to assess quality control, and staff feel that their value is appreciated. Staff know that vigilance is needed to avoid poor cooking practices, which might cause food to deteriorate and produce an adverse reaction from the customer. Customers might tolerate some poor results from traditional catering, but not from cook-chill, which is still in its relative infancy, and considered somewhat warily by the public as "new technology". A better public perception of cook-chill has to be encouraged to assist the advancement of this technology within hospitals and commercial catering .

4.8 CASE STUDY 5 - NATIONAL HEALTH SERVICE BURTON UPON TRENT (CENTRAL PRODUCTION UNIT)

4.8.1 Introduction

Burton District Hospital NHS Central Production Unit (CPU) provides meals for nine units ranging from Burton upon Trent to North Worcester. It was opened in 1988 at a cost of £2.75m. This money was raised by the Staffordshire local authority; whether by foresight or from necessity, it has turned out to be advantageous and could turn into a commercial enterprise. One of the great problems of the catering operations within the N.H,S., if they choose to develop a CPU, is that the Authority has to raise the money itself from its own budgets, which means that other areas are not resourced, or are under-funded. Again, this type of resourcing means that further development of the CPU could be curtailed, as it appears to be operating as expected, producing 22,000 meals weekly, but money for expansion of the premises or for better and more productive equipment is not forthcoming. Although the capacity of the CPU itself could be 40,000, meals this would be hard to produce without a different packaging system and extra chilled storage space.

It appears that the Staffordshire region is going to purchase all commodities centrally and distribute to each unit and hospital from their requisition. This has caused particular problems in that it is now clear that the central stores are not big enough to accommodate all commodities for every hospital, within one warehouse. Also, it can be restrictive to be tied to a central distributor who may not have available the specific items that each hospital has bought previously or costed for. This CPU has developed specification sheets for every item and costed to that commodity; with a new wholesaler, they may not achieve the yields costed for: a real trial-and-error exercise, but top management in the NHS may feel this is a way of reducing costs.

4.8.2 Kitchen Layout and Equipment

The space used as the production kitchen is small compared with other kitchens visited in this survey. However this unit is purpose-built and adequate for the meals being provided, and for further production. It is open-plan to the extent that rooms are attached to the central production area for example pan wash and larder for meat preparation. This the production managers would change, to prevent the chefs from entering into the preparation area and obtaining the raw meat, which could cause cross-contamination. To conform with the Food Hygiene (Amendment) Regulations (1990) they would prefer their employee, the butcher-chef, to work in a closed refrigerated environment and distribute the meat to the chefs to keep better bacteria control. The reason for not purchasing all meats ready-prepared from a wholesaler is to buy at a better price and to slice and portion meats to their own requirements.

Storage control here is to a high standard. Unlike the Queen Elizabeth Hospital, each store and refrigerator is locked, with only the storekeeper holding the key. The production kitchen has to order daily what is required, and these items are held in the appropriate kitchen store. Daily stock takes are made within this storage area. It would seem that any mistakes made by the chef, such as over-ordering or miscalculation of numbers of portions required, have to be rectified. In this case, the chef has to produce the extra meals miscalculated in his own time, and without pay: a reprimand not to be repeated.

4.8.2.i Wash-up Area The pan wash consists of one Hobart machine that cleans everything from trays to the ventilation ducts, producing good results and sterilising the equipment in the process. The production manager stressed the importance of this exercise compared with the traditional kitchen porter, who scrubs or scrapes the equipment. It is essential that all items are kept clean and spotless to restrict any cross-contamination in the food production process.

4.8.2.ii Bakery The bakery section is again small but adequate. This area appears to be continually in use within the 14-hour day, five days a week cycle. One large Hobart machine and a pie moulder are the only pieces of equipment on display, plus a bank of three convection ovens. The production manager stated a preference for two combi ovens and one convection oven to have the flexibility of steaming and baking.

4.8.2.iii Vegetable-Preparation Area The other preparation area is the vegetable section. Here extra space has been created by the removal of the potato peelers, as all root vegetables are purchased ready-prepared to save on labour, but mainly to prevent dirt and mud coming into the production area. Also at 1p per ½ kg. extra, the cost is minimal compared to employing people to clean and scrape vegetables. The one piece of equipment used here is the Swedish vegetable slicer, an asset to every kitchen, as it achieves all the slices or cuts of vegetables required. What is needed is a machine that can portion creamed potatoes into scoop-size portions, as the chef here has to produce 6,000 portions, with the aid of an ice-cream scoop, into twelve- portion containers on a daily basis - a time-consuming and tedious task.

4.8.2.iv Central Island Layout One of the island planned production areas contains three bratt pans, (considered essential items), backed up to two grills and three deep fat fryers. On the other island are three pressurised steamers alongside three high pressurised steamers. These are backed up on to the boiling kettles used for soups and vegetables. A preparation table stands at the end of each island, please see figure 4.8.

4.8.3 Staff Retraining

The head chef had been sent to other units before the commencement of the CPU but he and the production managers feel it took nine months to train the staff to the high standards of production required.

Training was mainly on new technology and hygiene standards that had to be rethought by the staff, and become automatic in their thinking. Because food is being cooked on Monday and not eaten till Friday, the staff have had to be re-educated from the old system of cooking food in the morning for service at 1 p.m. on the same day. Psychologically, this was a strange concept for traditional chefs and cooks. Of the original staff, only 60% have remained. Some have left for better jobs, promotion or pay; others disliked the steady factory production system and missed the peaks and troughs of the traditional system. The ones who remain are fully committed to the cook-chill system, and many state they work harder under this production system than the old one, as there are no slack periods, i.e. no peaks of service. They are producing food constantly throughout the day. This unit employs 25 members of skilled staff either on a full-time or a part-time basis, producing 22,000 - 40,000 meals weekly.

4.8.4 Packaging and Storage

The food produced is portioned and stored in oven-proof cardboard containers. Each container takes a maximum of twelve portions. These are put into the chillers which hold 180 portions each, within a bank of three. The production manager's opinion is that two chillers holding 360 portions each and one holding 180 would be more beneficial and flexible for production purposes.

The packaging machine is totally inadequate; there being only one, it cannot afford to break down, otherwise the whole process will cease. This machine is used to lid and seal every container manually with one female assistant to perform this task. Two machines would be quicker and would allow one machine to be serviced in case of faults occurring. This is also one of the reasons why the CPU cannot go into full production of 40,000 meals weekly, as the original planners could not foresee the demands put on one machine and operator. At the moment, 22,000 meals are provided for nine separate hospitals ranging from Acute General to Psychiatric.

4.8.5 Summary

This CPU has been approached by many other units to produce meals for them, but the first year has been spent perfecting the production system, and retraining the staff to improved recipes and to rethink previous methods of cooking, before taking on extra commitments. Although changed minimally from traditional methods, a new concept was being undertaken mass producing food at the CPU. Meals produced increased from 260 meals daily to 6,000. It would appear that a purpose-built CPU (as at Burton) is the way forward for the NHS catering services, rather than a converted production kitchen. In conversions, the problems of the old kitchen remain, in particular, not enough space where it is needed. It is essential to obtain the flow of work correctly within one space at a controlled temperature to prevent food poisoning, and to create a kitchen that can be kept spotlessly clean. With converted kitchens, problems occur when one side is producing food under the cook-chill system and the other side producing conventional cooking. This system is not effective, as control is not adequate, with staff crossing from one area to another and the food not progressing from the cooked state to the chilled state in a correct sequence of temperature control. Usually the cooked food is banked up in the corner of the kitchen, waiting for the next process, and exposed to other staff passing through the kitchen en route to the dining-room or wards. This is open to food contamination. The Burton CPU is not perfect and the existence of unforeseen capacity constraints shows the importance of careful attention at the initial planning stage.

From the financial aspect, this CPU made £20,000 profit from its first contract. It is limited at the moment to 22,000 meals per week due to lack of storage space for the chilled food and it urgently needs a fully automated packaging system. The local authority are aware of this, but have also stated that the CPU will need to finance this expansion themselves.

For future CPUs selected, multi-purpose equipment needs to be employed. This would include:

(a) combi ovens (b) pressurised bratt pans (c) high pressurised steamers (d) liquid cook chiller (e) cool-zoned deep-fat fryers (f) an automated packaging system, (if cardboard containers are used).

New portioning systems have to be developed for creamed potatoes and dishes that need topping, such as apple crumble, which can be time-consuming for the staff concerned. Also larger chilled storage areas need to be provided, so that a wider market can be met. A factory-type system selling to various outlets e.g. hospitals, schools, conference centres etc. would be a high productivity revenue-earning system. For the future, it would be a way of employing a few highly-skilled staff in one unit, with semi-skilled staff regenerating and serving the meals in the satellite kitchens or staff restaurants. This would also help to alleviate staff shortages forecast with demographic trends.

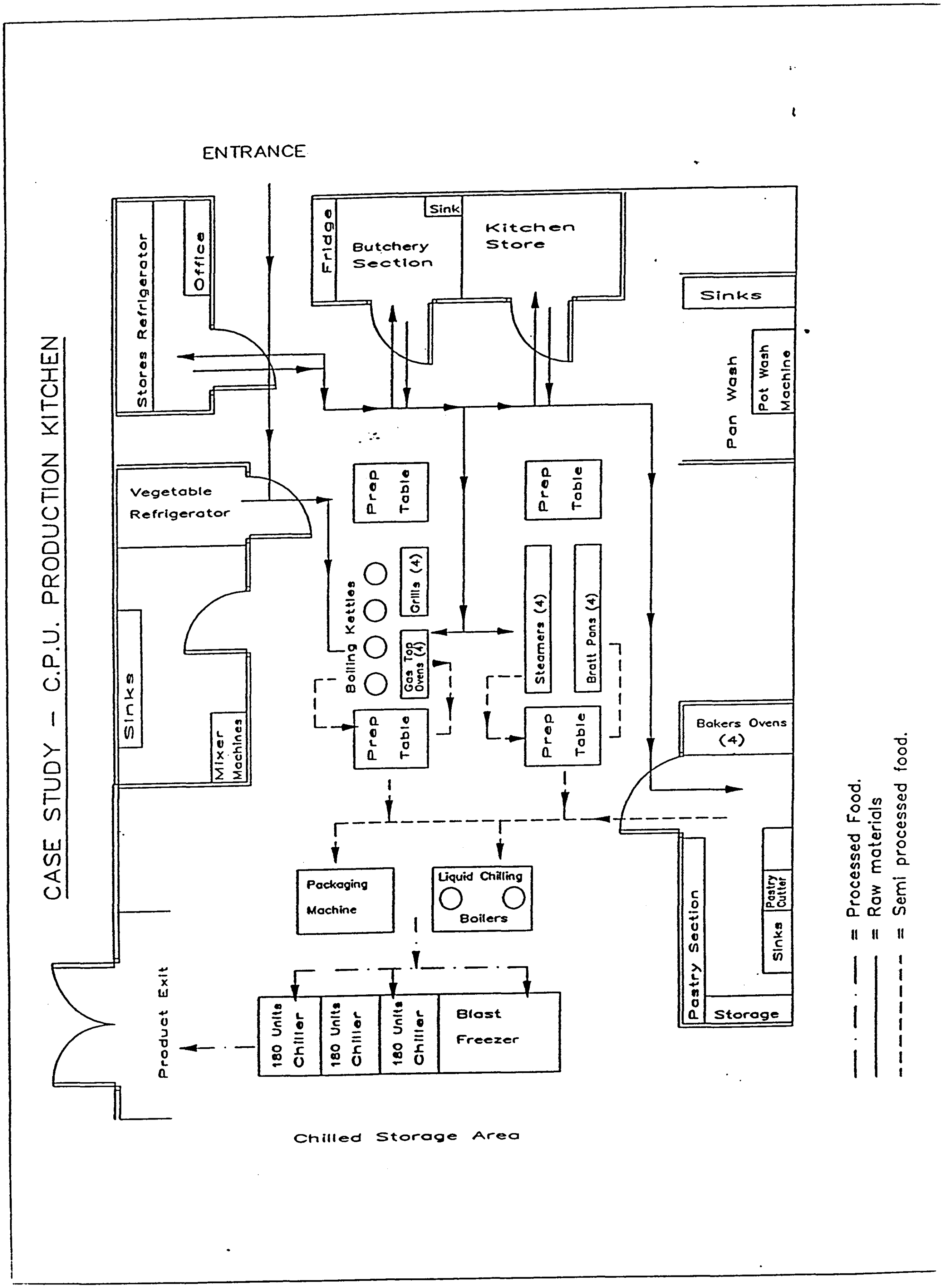


Figure 4.5 Kitchen Plan - Burton upon Trent CPU

4.9 CASE STUDY 6 - MOUNT ROYAL HOTEL: COOK-CHILL.

4.9.1 Introduction

This hotel employs eight chefs who work an eight-hour day from Monday to Friday, with sufficient flexibility to allow production staff to enjoy normal statutory holidays, annual leave and occasional absences, without disrupting the proper functioning of the production system. There is a fairly consistent demand of around 1,000 meals per day for the restaurant, coffee shop and banqueting rooms.

4.9.2 Kitchen Layout and Equipment

The present kitchen was purpose-built in 1980 on the original site of the production system, incorporating blast freezer and chillers and packaging unit. This system involves the separation of food production from service by holding some cooked dishes safely in chilled conditions of 3^{oC} for up to four days. Menus are planned by the Head Chef in conjunction with the guests' requirements, whether conference, banquet, restaurant or coffee shop. The restaurant draws chilled items from stock according to the menu and these are reheated (40 minutes) to 70^{oC} in the regethermic mobile ovens for the banquet rooms or within the microwaves for the restaurant of coffee shop service.

The production kitchen is not large. Although occupying the same area as the previous kitchen, it now incorporates a packaging room with a vacuum packer, a blast freezer and sufficient chilled storage space for two days' menu items for approx. 2,500 meals.

By using efficient, large batch production methods of cooking, 800 portions of say chicken, Cordon Bleu can be produced in one production session. After the cooking process, these would be trayed up in quantities of 24 portions per gastronome container for a banquet, or vacuum-packed in smaller numbers for the coffee shop or restaurant customers. The commodity is then chilled to the required temperature of $3^{o}c$ before the commencement of chilled storage. There the food is monitored to assess that the correct temperature is maintained, until the product is required.

The kitchen layout uses a central island, with 1 steamer, 4 bratt pans, 1 broiler, 2 convectional ovens, 2 gas ranges, 2 deep fat fryers.
Please see figure 4.9

The production equipment is now thirteen years old and requires updating, as daily use has caused deterioration. Hotel maintenance staff are, however, capable of carrying out repairs as long as spare parts are available. The vacuum packer is five years old, but it appears that, as the supplier regularly updates his production equipment, it is now no longer possible to obtain spare parts for the original packer. It seems that companies' haste to be in the lead with catering technology jeopardises the availability of spare parts for older models, and creates expense for catering organisations, who need to repurchase new for old. It is important that all pieces of equipment are functioning correctly in any production kitchen. However when cook-chill specialist equipment is used any breakdown means less quantity of food produced, which affects that day's schedule.

Under the cook-chill system, there is no limitation to the menu planning, but items produced in bulk quantities must still retain quality and presentation. This system is highly efficient for conferences and banquets, where a five-course meal is offered, but can still be utilised for small select restaurants offering A la carte menus.

4.9.3 Staffing

The present kitchen is operated by eight chefs on a straight shift, where the previous system required twenty-eight chefs. The production staff at the Mount Royal enjoy better working conditions, not only in their working day, but also in their physical working environment, as they are no longer under pressure to produce meals for a specific meal time. However they do follow production schedules. This allows time to be dedicated to the training of commis chefs in better circumstances than normally prevails in the traditional production kitchen. Chefs are enabled to practise and extend their culinary expertise fully in the preparation, cooking and presentation of dishes in a light, airy, relaxed kitchen.

According to the Head Chef, when prospective chefs are interviewed, emphasis has to be put on the technical differences between traditional food production and the cook-chill system. Some chefs cannot work effectively without the pressure and the demands of the fast-moving traditional production system. The Head Chef also feels that Catering College graduates are not sufficiently informed or instructed in the use of modern technology, for example, cook-chill production or specialist equipment. This has been found to lead to poor recruitment decisions and a high percentage of staff turnover. In his opinion, education and training tends to concentrate on traditional cuisine (i.e. partie system) rather than on the benefits of technology and how it can assist the chef, particularly in reducing some of the tedium of food preparation and the physical and mental demands of peak service times.

Generally, the whole cooking concept has to be rethought by the chef. For example items like sirloin steak are too thin to be cook-chilled and then regenerated. Instead fillet steak is used, (being thicker), cooked rare and reheated in the regethermic oven.

Under the cook-chill system, pressures on staff are of a different nature from traditional catering. Instead of short periods of high activity to meet meal deadlines, batch cooking necessitates the cycle of cooking, chilling and storage within a set period, which evens out the "highs and lows" which chefs may be familiar with. After initial training and re-thinking the production/cooking methods to fit in with batch cooking, the latter system may be preferred, particularly as staff turnover appears less than in the traditional operation. Practical skills are still needed and staff need to be more vigilant to ensure that food items are cooked correctly, to withstand chilling and then regeneration. A poorly-cooked or contaminated product could cause an outbreak of food poisoning, as consumption is not immediate. Over-cooked items, on the other hand, would look unacceptable on the customer's plate, once regenerated. Strict production schedules are needed, as nothing can be left over for chilling the following day. Procedures must conform to the strict hygiene practices required by the Head Chef, and the Department of Health Guidelines on Cook-Chill. The only products that are restricted on the menu are breaded items (for example goujons of sole) as the breadcrumbs remain soggy when reheated.

4.9.4 Summary

Certainly, a more relaxed atmosphere prevails during the working day at this hotel. Although the pressure of work is constant and strict schedule deadlines have to be adhered to, the chefs do not experience the same demands occasioned by the imminent food service times in the traditional hotel. With traditional banquet service, of for example 1000 covers, it would be necessary to have a minimum of possibly ten chefs on duty to cook/reheat, produce and present the food onto the silver salvers for service by the restaurant staff. At the Mount Royal Hotel, only one chef is required to complete the garnishing of the food on the salvers for a banquet of that number. Not only are staff greatly reduced, but the service time can be more flexible, should a delay occur, as no final cooking is required on regeneration. This also alleviates staff pressure, as the chef at the Mount Royal knows that the finished food is complete and no overcooking should occur (as can be the case in the traditional banquet system).

Recruitment of staff has to be assessed differently for the cook-chill operation. The chefs have to be highly-skilled for both production systems, but with cook-chill, the chefs must be aware of the strict controls of the cook-chill requirements, and the necessity to work in a production line operation, in straight shifts. This may be a factor that Catering Colleges need to re-consider, as many are traditionalist in their approach, concentrating mainly on the partie system. Also, a growing percentage of hotels (including 5 star establishments) do operate under a partial cook-chill system, as has been shown from the questionnaires.

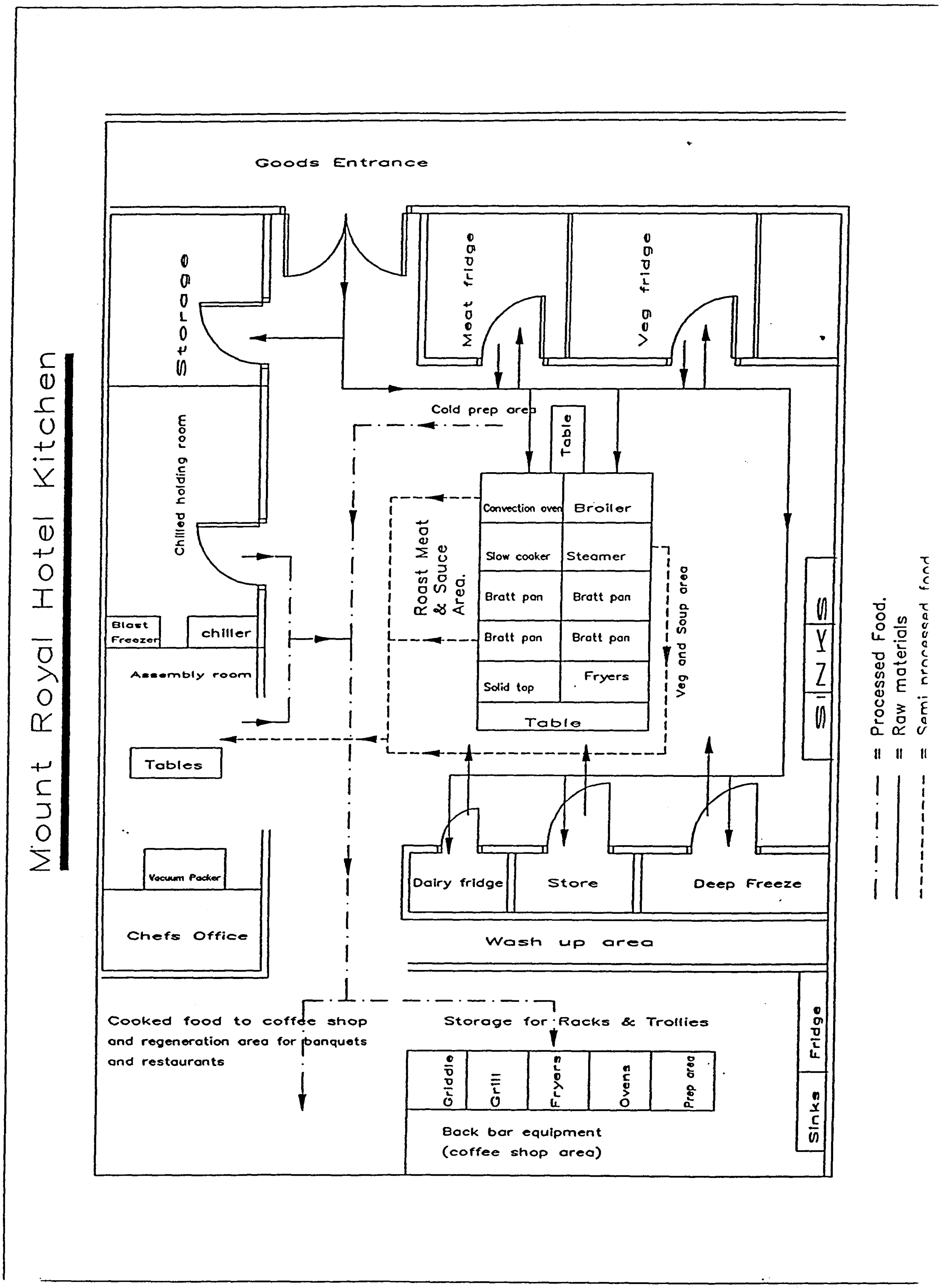


Figure 4.6 **Kitchen Plan Mount Royal Hotel CPU**

4.10 ANALYSIS OF CASE STUDIES 5 & 6 BURTON CPU AND MOUNT ROYAL CPU

The major emphasis here is the evident reduction in staff numbers required to produce good quality food and still maintain high standards and profit. Both kitchens operate within an open-plan aspect, which seems to benefit staff and allows for better control and observation by the head chefs. Staff working in a controlled ventilated system are better able to maintain a steady production output, with the additional benefit that staff are not pressurised by the peaks and troughs of service and staff turnover is less.

Within both CPUs, it is considered by the head chefs that more up-to-date specialist equipment would improve the production system by providing better quality control of the cooked food. With the substitution of the cook-chill system for the traditional method of food production and immediate food service, large quantities of food can be produced with a limited amount of specialist equipment. The traditional kitchen designer could attribute this simply to the fact that batch cooking is involved, and immediate food service not required. However this is not sufficient explanation, as with either system (cook-chill or traditional production), less production equipment is required if versatile specialist equipment is purchased. Specifically combi ovens, pressureless/pressure steamers, pressurised bratt pans can all improve productivity in a batch cooking environment. Additional specialist equipment may be needed, depending on the production system (for example packing equipment for cook-chill or halogen hobs for traditional production). Thus a kitchen with more streamlined catering technology kitchen can be achieved, offering a good working environment for the production staff. Amidst all this technology such simple practices as buying in pre-prepared vegetables can lead to increased productivity and a reduction in labour. Cross-contamination can also be prevented by not bringing root vegetables into the kitchen.

In both establishments, the value given to staff training is paramount: staff need to be recruited with a better understanding of catering technology. Catering Colleges need to offer catering technology options in the final year of courses. Not every chef/caterer either wishes to or will have the opportunity to work within a traditional partie system. Split duties or shifts required within traditional kitchens may provide additional incentives to work in one of the more modern production systems.

4.11 CASE STUDY 7 - BREWERS FAYRE, SHERWOOD INNS (WHITBREADS).

4.11.1 Introduction

This is a modern concept in public house catering, mainly on a green field sites often accessible only by private transport involving large purpose-built pubs or converted premises with plenty of parking space. The concept is targeted towards the 50 - 55 plus age group and family market, offering children's meals and recreational opportunities.

The interior could be classified as a mixture of styles, possibly to cater for a variety of aesthetic taste in interior design. There is plenty of colour, but it is not a relaxing atmosphere, as a fast turnover of customers and food is the aim.

4.11.2 Food Service System

The customer places a food and drink order at the counter (giving table number) which the staff then communicate to the kitchen, using the Electronic Point of Sale (EPOS) system. Speed of food production and service is the main concept behind the operation. The food should arrive at the same time as the customer returns to the table with drinks. However the likelihood of congestion, owing to demand, often precludes this and queuing is a major problem to overcome. This particular Brewer's Fayre caters for 250 customers requiring Sunday lunch and inevitably some queuing occurs.

The sale of food is the main purpose of the operation. From £12,000 to £25,000 per week can be obtained, depending on the location, atmosphere, and presentation of food.

4.11.2.i Staffing Throughout the pub 50 staff are employed both full-time and part-time. Kitchen staff on any one shift comprises three - five chefs (depending on the day of the week) with two people in the wash-up and one on the starters.

4.11.2.ii Menus Menus are standard throughout the region. However variation is provided through dish of the day "specials". The chef/manager changes these daily according to the demands of the customer or season of the year. The Group Operational Manager stipulates that the provision must beat least two meat, one fish, one vegetarian dish, with not more than six choices. The standard of food must be of consistently high quality to attract the customer back.

Although the food is 95% convenience products, the cooking of these commodities must be precise. The staff are trained to operate the equipment and understand that presentation is their responsibility. Under-cooked or over-cooked food loses eye appeal and customers. The products are standardised. For example that seven deep fried mushrooms must be served to the customer (it has been found that customers write complaining to Head Office if they are given seven, eight or ten mushrooms per serving at different houses.) All customer complaints are answered and queried at the relevant houses. Management policy is that the customer comes first.

In this particular Brewer's Fayre, the chef/manager is a member of the menu-planning committee, which meets twice a month to assess new menu dishes suggested by the Area Catering Manager. A selected item is placed on the menu in certain houses for a trial period to assess demand. Some menus are static for six months, there is no point in removing a dish that has high customer demand for a product that has low customer demand. Other factors have to be considered too. Houses have managers who vary in their range of ability, skill and knowledge of food. It is therefore unwise to include menu items which are difficult to prepare or present, particularly when the kitchen operation is dependent on semi-skilled kitchen staff, who are prone to spoil food. Also some modern equipment is not being used to its full advantage, simply through lack of knowledge and training. This is an area that is being rectified by in-house staff training, or by day release to catering colleges.

4.11.3 Kitchen Equipment and Layout

1 Hobart mixer

1 griddle

3 deep fryers (double, 1 single)

2 microwaves

2 walk in fridges (1 chiller, 1 deep freeze)

1 bratt pan

2 ovens

1 x 4 gas burner hob
1 combination oven

1 work top, 2 waste bins

1 refrigerator

6 chill drawers (Williams)

1 hot plate.

2 table top fryers

1 grill

hot water boiler (still area)

1 refrigerator

2 work tops

2 sinks - food preparation

Wash Up

1 dishwasher

Areas for stacking clean/dirty crockery

With up to 300 meals being served at one session, the kitchen area is hot and cramped, affecting flow of work. One aspect in this kitchen seems to be lack of sufficient ventilation. A complete air change every two minutes should be allowed. If temperatures rise above an acceptable level, fatigue among operatives is increased, tempers become frayed and the output and standard of the operation suffers.

It is clear that the wash up area should be nearer the restaurant. For example it could be positioned in place of the starters area, to prevent congestion of restaurant and kitchen staff in the kitchen space. The combination oven is not used to its full capacity, ie for baking and roasting, but is used primarily for steaming vegetables.

Fuel energy is thus wasted by the slower process of baking items (such as potatoes) in a conventional oven. The combi oven cannot easily be used for both roasting and steaming, as it takes 30 minutes to cool down before it can be used solely for steaming. A pressureless steamer would ease the overcrowding of other equipment and save on staff time and energy costs. The bratt pan was found to be essential for stewing and shallow frying.

It has been recommended that large-scale equipment needs to be mobile for cleaning purposes, to meet the requirements of the 1990 Food Safety Act and visits from the Environmental Health Officer (EHO).

The managers state that the after-sales service regarding breakdown of equipment is unacceptable, with three to five days before an engineer appears. Some of the equipment (combi oven and microwave) selected for the kitchen cannot always survive heavy usage. Considering the volume of sales anticipated and the wear and tear from daily use, the equipment is not robust enough to cope. One piece of equipment out of action can disrupt the whole flow of work and the staff's ability to manage. There has been a 50% turnover of staff in eight months resulting in training problems.

4.11.4 <u>Summary</u>

This case study suggests that dependency on unskilled staff is the greatest problem for this Brewers Fayre, and that a good in-house training programme is needed for kitchen staff to be confident and capable of producing menu items. This could be achieved with an induction programme including correct timing and temperature control and versatile use of catering equipment. This would enhance customer satisfaction and enable staff to work within the requirements of the 1990 Food Safety Act (ie that hot food is maintained at a temperature of 63^{oC} or above).

Use of food production schedules and a knowledge of better cooking methods for certain dishes would allow for an improved throughput of food to the restaurant. This could be achieved with the installation of a pressureless steamer and better use made of the combi oven, which would also help to reduce the dried-up appearance of some of the food items that are cooked/reheated in the microwave or ordinary ovens.

The flow of work is also hampered by the amount of cross-flows of restaurant and kitchen staff who are either fetching foods or returning dirty dishes to the wash-up. This causes staff irritation and may result in staff absenteeism when the queuing or congestion causes the kitchen to become unworkable. This leads to high staff turnover, which brings about customer complaints and a drop in profits.

It is noticeable that even with this up to date catering concept, employing convenience foods and state of the ark service technology, the food production basics are still lacking, see Figure 4.II. The equipment layout is not ideal for a balanced operation. Poor layout results in difficult working conditions. A poor physical environment contributes to high staff turnover. Such failings are even less understandable given that this is a multi unit standardised concept. Here there is surely an incentive to get basic things right, since the system will be duplicated many times over.

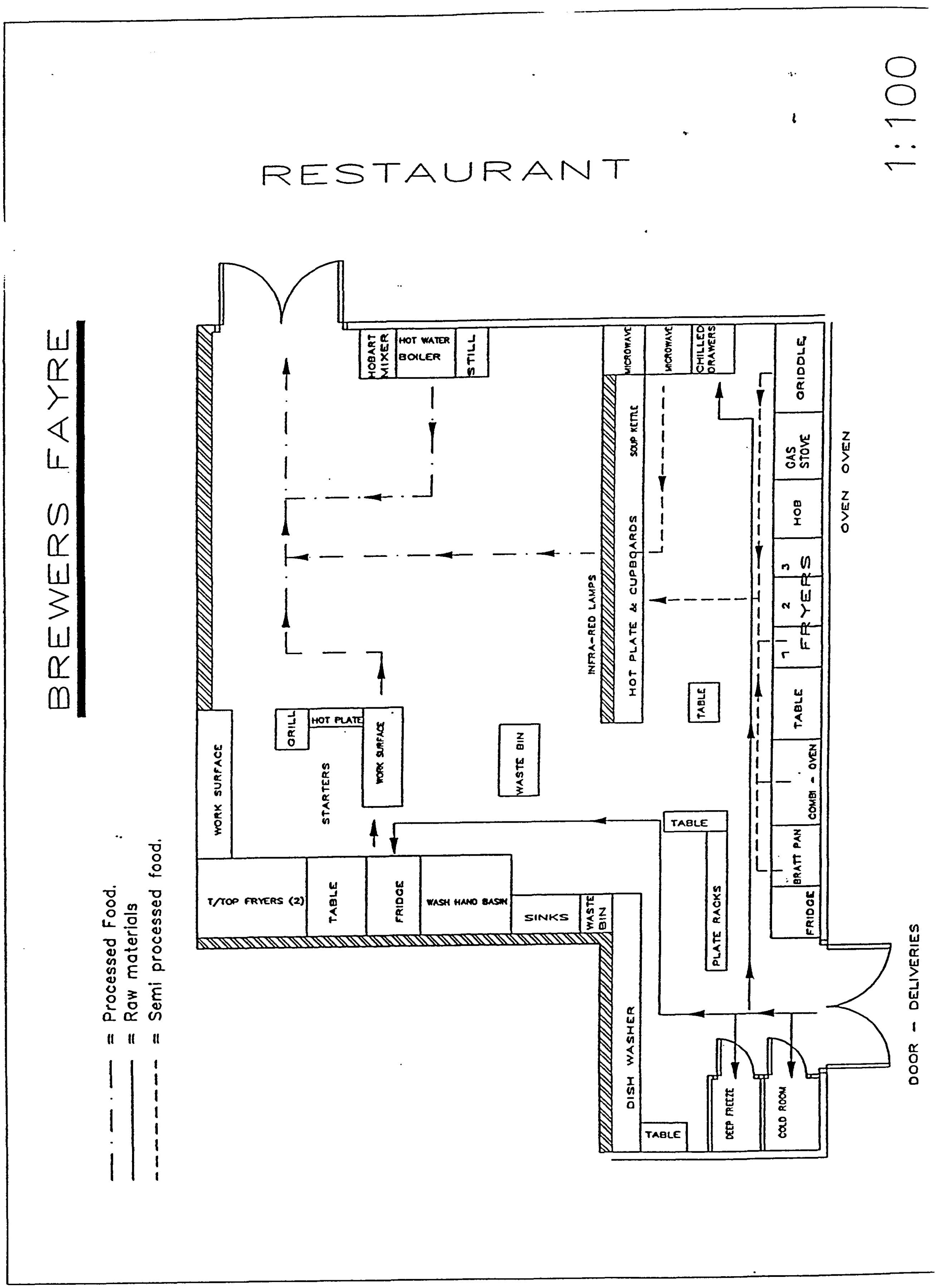


Figure 4.7 Kitchen Plan Brewers Fayre

4.12 CASE STUDY 8 - BREWERS TAVERNS, SHERWOOD INNS (WHITBREADS)

4.12.1 Introduction

This particular unit has been recently refurbished to its present grandeur from a public house in a smart conservation village near Barnsley. It is well situated in the heart of the village with adequate parking and disabled access. Although families are catered for, it has, unlike the Brewer's Fayre, an atmosphere and aesthetic feel more suited to couples and those seeking a leisurely lunch or evening meal without children. Decor is subdued and relaxing and the managers generate an attitude of friendship and camaraderie that guests enjoy and want. No dart boards or skittles are found here.

4.12.2 Food Service System

The EPOS ICL system is used here, as in the Brewer's Fayre. It is fast and saves time and labour for the restaurant staff. Guests give their table number and meal order to the restaurant staff, who key in the required dishes, which are then transcribed on to the kitchen order board for the chefs. When the plated meal is ready, a light comes on in the restaurant to summon staff to the kitchen. This prevents the usual congestion that occurs with staff queuing in the kitchen and placing their order manually. However, if a large party is booked into the restaurant, restaurant check pads are used, to prevent crowding near the EPOS system.

This particular tavern has seating for 40 people in the restaurant and 50 bar meals, although on a busy lunch time, meals for 170 customers have been produced. The kitchen is operated by one chef and one kitchen porter, on a 6 hour shift, but two chefs are needed on a busy day, usually Sunday.

4.12.3 Menus

Menus are standard throughout the Sherwood Inns enterprise, although with the 'Taverns' it is expected that the Chef/Manager will produce more home-made food than within Brewers' Fayre. (This is incongruous, as in this instance the kitchen is small and cramped with minimal kitchen equipment, that is static and non-versatile for flexible food production). Special dishes offered are at the discretion of the Chef, who produces dishes to his/her own specification. As kitchen gross profit has to be considered, the special dishes have to fall within the customer's average spend; the usual sales mix ratio is at approximately 60% standard menu dishes, 40% proprietor/chef's specials. This is necessary to create interest and motivation for the managers, who maintain a high standard of professionalism and commitment to the business.

4.12.4 Kitchen Equipment and Layout

For a kitchen that has been refurbished two months ago. This is lacking in sufficient consideration of employees' work flow. Staff movement and work flow are restricted, and in two instances (detailed below), dangerous for the kitchen staff.

Equipment consists of:

Hotplate/cupboard with infra red lamps, (good for maintaining correct temperature control), two fryers, one griddle, one grill and double oven plus six ring gas burners and two microwaves.

A self-contained salad section is across the room in a recessed area, opposite the wash-up area that holds the dishwasher, two sinks and shelf racking for crockery. All are spotless and well-maintained.

The refrigerator and a deep freeze is within the kitchen area. Down six steps leads to a walk-in chiller and deep freeze, plus dry store, all essential for the production (see Figure 4.12).

Inconvenient/Dangerously-placed Equipment

The grill is placed directly above the gas stove, which is both too high for a short employee and restricts use of the gas burners. The oven is placed against the wall, next to the table holding one microwave oven, making it difficult for a tall person to bend in this area. The second microwave is placed on a shelf above eye-level, which jeopardises safe usage.

Optimum Equipment could consist of the following to allow flexibility of menu and use of equipment and aid staff safety.

(a) Pressure/pressureless convection steamer for vegetables, both to retain colour and for speed, for the large quantity of vegetables prepared and cooked.
(b) Combination oven to cope with the wide choice of menu offered.
(c) Maelstream microwave in place of existing domestic ones. Although the microwave is used to its full capacity, and probes are in evidence, this piece of equipment does not produce a full meal on its own.
(d) Mobility of equipment: except for the oven, which is on wheels, the equipment is not mobile. For ease of cleaning, and to prevent back problems for staff, it is essential that equipment is easily moved.

With more thought and money spent on kitchen planning and work flow, a better working environment could be achieved. It was strongly emphasised by the manager that if kitchen planning is defective, and the staff become harassed and under pressure from cramped working areas, and without versatile catering equipment, their attitude and work is adversely affected. This in turn affects the restaurant staff, and the customer then suffers, if poor quality food is served.

4.12.5 Summary

From this case study, it would seem that equipment manufacturers have to make equipment mobile for hygiene purposes, including ease of cleaning walls. Optimum use of catering equipment (for example combi ovens and pressureless steamers) is necessary to keep up with demand for variety of choice that today's customer expects, and to prevent menu fatigue for the chefs. In spite of maximum use of convenience foods in both kitchens (i.e. Brewers Fayre and Tavern), the demand for meals seems to be exceeding all expectations. Therefore, to meet this demand, and to create a better working environment in order to retain staff, kitchen planning, work flow and appropriate catering equipment need to be fully considered.

It is very surprising that a kitchen refurbished only two months previously should be so inadequate both in terms of its equipment specification and its layout. Effective food production planning seems to be a weak link in the catering system planning process.

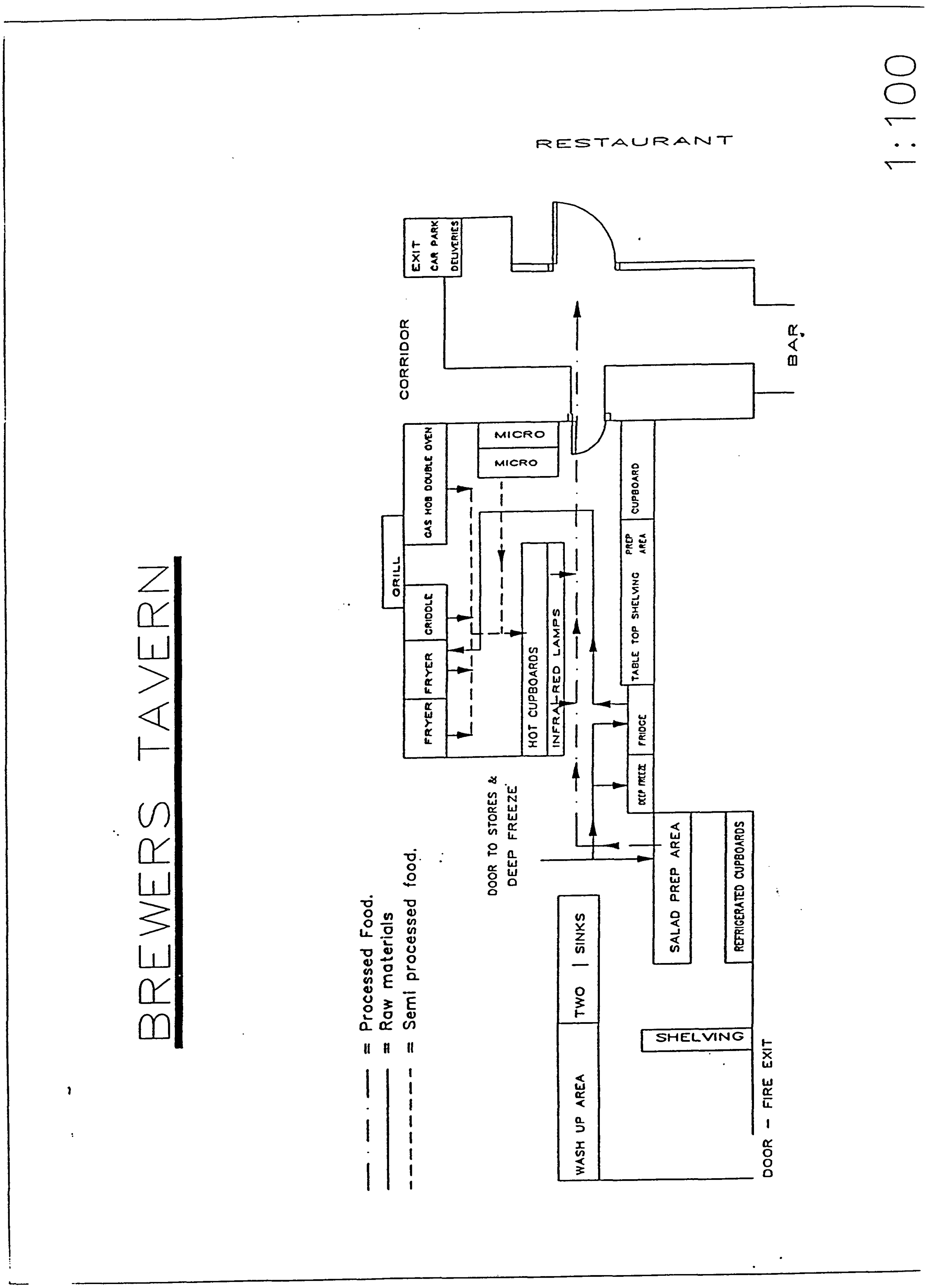


Figure 4.8. Kitchen Plan Brewers Tavern

4.13 ANALYSIS OF CASE STUDIES 7 & 8 - BREWERS FAYRE AND BREWERS TAVERN

Both of these restaurants have been designed to cater for a specific clientele: in the Brewers Fayre, with their out-of-town locations, mainly family and passing trade; in the Taverns, discriminating customers seeking a high standard of food, service and ambience. Both enterprises depend on returning custom. With good aesthetic appeal and positive staff attitudes, this is being achieved, particularly within the Brewers Tavern, where the management team are professional in their approach to the guest and the quality of food provided.

The difficulty for both establishments is their dependency on semi-skilled staff in the production kitchen, and an extremely poor kitchen design and planning, which causes staff fatigue and congestion when customer demand is high. Both kitchens are a good example of the kitchen equipment specialist delivering and installing catering equipment without considering flow of work or the employees' competence in using the equipment. For example, in the Brewers Tavern, outlet where the grill covers the griddle and gas hob it would appear this is badly-sited and unsafe for the user, and one oven is difficult to operate because of its location; also a microwave is placed on a shelf above eye-level. In the Brewers Fayre, the chefs lack knowledge and skill in the use of certain items of equipment, which are not being utilised to their full potential.

Poor kitchen planning and ventilation has led to staff absenteeism, obliging one of the managers to operate as the chef, to cope with customer demands. This increases the work of the management team who find it impossible to cover both the front of house and production of food.

Improvements to be considered are;

(a) a good induction and training programme on the use of catering equipment.

(b) a better kitchen design and planning in small kitchens to allow for smoother work flow.

(c) the use of a minimum specification of versatile equipment to produce food to a good standard, within a well-ventilated environment.

4.14 Conclusion - Case Studies

Catering technology has been used to increase productivity in various forms within the case studies from low technology (specialist equipment) Case Studies 1 and 2 to high technology (cook-chill) within (Case Studies 4,5 and 6). Ross (1971) agrees with the impossibility of producing all items from the raw state and all cooked simultaneously for cook-serve production. To achieve an acceptable consistent standard of food quality catering technology has been incorporated into production kitchens as shown within the case studies. Although technology varies greatly within the kitchens, Simons (1991) states the benefits of using technology to gain better control and productivity when compared to traditional methods.(Case Study 4). Synder (1983) Jones (1988) agree that good food production processes minimises energy and labour needs and optimises production time and product yield which confirms the benefits of technology when used correctly. Training and safety aspects are essential for the user although this aspect has not been considered fully in (Case Studies 7 and 8).

Giampietro (1980) states that many food production systems have been planned without the needs of the chef being fully considered. This is emphasised within (Case Studies 3,7 and 8) with incorrect layout and kitchen design. Kirk (1989) confirms as in (Case Study 7 and 8) that equipment manufacturers are usually concerned with installing many pieces of equipment not necessarily concerned with the production method or limited range of menu. Work flow is of crucial importance to food production and within these two case studies emphasis on poor planning is evident. Another aspect raised by the case studies is the benefits of retaining staff noticeablely (Case Studies 1,3,4,7 and 8), possibly poor kitchen planning and inadequate ventilation causes staff turnover or absenteeism. Rozario (1988) The International Labour Office (1979) confirm an effective working environment is necessary for staff morale as in (Case Study 2,3 and 5) which have a good circulation of air and adequate space.

Within the case studies reference to organisational change became apparent. Rhodes and Wield (1985) confirm that training employees correctly is essential to obtain co-operation and understanding as in (Case Study 2,4,5 and 6). The implications of this problem was emphasised in (Case Study 4) where one manager attempted successfully to instil motivation into employees for organisational change by quality training programmes. He communicated the need for change to a cook-chill system both to his staff and potential customers. This management style could be classified as "Achievement-oriented" Harrison (1987). This contrasts radically with another hospital (Case Study 3). Low staff morale has been indicated in (Case Studies 3,7 and 8) where change has occurred without involving staff. Markowich (1971), Skroder (1981), Pine (1989) also confirm that good communications between staff and management is essential for employee motivation.

It became apparent from the case studies that training in the correct use of equipment was necessary also good equipment layout benefited staff in maintaining their energy with good work flow. Some head chefs and catering managers were aware of the problems but they had little control over the resources to operate change.

From these case studies questionnaires were designed to assess the types and number of specialist equipment used and systems technology and whether these aid productivity.

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SECTION 5

HOSPITALS AND HOTELS SURVEY

5. HOSPITALS AND HOTEL SURVEY

5.1 Postal Survey

A survey investigating aspects of the relationship between productivity and catering technology was conducted. Questionnaires were sent to 90 National Health hospitals and 170 four/five star hotels. These organisations were selected from a population drawn from the Hospitals and Health Services Year Book 1991 and the Financial Times World Hotel Directory 1989. Large teaching hospitals and four/five star hotels were assessed as being providers of large food production operations. The questionnaire was formulated to further investigate issues which arose during the case studies.

5.2 The Purpose

The survey was carried out to assess the extent of utilisation of high technology food production systems and modern equipment in hospital or hotel kitchens, and to explore the effect on productivity. More specifically:

a) To provide an insight into the type of food production systems being used.

b) To investigate the type of equipment utilised within these systems.

c) To investigate standards of productivity within hotel and hospital kitchens by:-

   i) Assessing the number of meals provided on a daily basis to correlate the number of staff employed with the number of meals produced.

   ii) Assessing the extent and effect of use of pre-prepared vegetables, used within different production systems.

5.3 Questionnaire Design

The questionnaire was designed to investigate areas of interest derived from the case studies and previous research associated with productivity and technology.

Previous productivity research has been carried out mainly by dieticians within American hospitals and based on American numerically based manufacturing theories. The research measurement basis was therefore not optimum for the hotel and catering industry. Within the catering industry numerical measures were also proposed by Zolber and Donaldson (1970). However they also stated that these were developed from manufacturing techniques and adapted to the service sector. Where a service sector approach has been used such as by Mayo and Olsen (1987), the measurement has focused on the ratio of inputs to outputs on an hourly basis.

$$\frac{\text{Total Food Servings Produced}}{\text{Total Labour Hours}} = \text{Servings Produced per Labour Hour}$$

(Source: Mayo and Olsen (1987)

Other researchers had already made attempts to do this. In 1970, Zolber and Donaldson studied relationships between labour productivity and five independent labour variables by using simple correlation in 14 hospitals. By using multiple regression analysis Zolber and Donaldson (1970) reported a positive relationship between labour productivity and five 'independent' variables, cleaning, clerical, processing of food, service of food and transportation of food. These five variables were investigated and recorded in terms of direct labour time <u>not taking</u> into consideration non-productive time during the day. They reported that units using an assembly-serve system had lower direct labour minutes-per-meal (showing productivity improvements) than those units using a conventional food service system. They defined assembly-serve as a production system utilising primarily pre-prepared items with little on-site food preparation. Kaplan et al (1969) also stated that food service systems converting from conventional service to convenience systems noted increased output per man hour.

Ruf and David (1975) also assessed productivity by using a ratio of output 'man-minutes' to total output or total meal equivalents served. They also assessed relationships between labour productivity and 'independent' variables by using correlation analysis. Higher counts of total meal equivalents were positively associated with factors leading to higher labour productivity. They also associated negative staff variables, for example fatigue and lack of interest with the job as factors contributing to lower productivity.

Brown and Hoover (1990) reported that measurement techniques of productivity that considered only one or a few of the production variables used to produce goods and services could result in limitations and potentially inaccurate productivity assessment. They recommended a <u>total factor</u> productivity model that related organisational output to all input resources. However it became apparent from the case studies that a total factor model would not be accurate enough if it included and assessed all the variables associated with a food production system; nor would it be feasible to use a work study technique on such a wide range of diverse operations. In designing the survey to achieve its purpose (set out on page 142) the above limitations and constraints were kept carefully in mind.

From the information gained from the case studies and the literature review it became clear that it was possible to assess various aspects of hospital and hotel production systems in a way that would produce quantifiable data. In particular, labour cost, food cost and sales generation were all readily quantifiable elements of the productivity equation. Of these, sales generation was discounted because of its non-applicability to the main thrust of hospital catering operations. Food cost was discounted because of the difficulty of obtaining accurate and meaningful data on a representative basis. Labour cost seemed to be the most promising area, as it was equally important to both hospital and hotel productivity. But how should this be researched? Investigation of cost would incorporate variation purely due to the price of labour. This would obscure the inherent productivity of labour. Other researchers (Zolber and Donaldson 1970) had utilised the measure of meals per labour hour to overcome this problem. This seemed an inappropriate method of measurement as it became apparent that hospital and hotel chefs/cooks did not calculate productivity of meals (output) on an hourly basis but on a daily or function basis. Within this research productivity was therefore assessed using a new measure of meals produced per chef per day (m/c/d). Therefore a questionnaire was designed to collect data on the types of catering technology/equipment used plus the number of meals produced, which could be related to the number of chefs/cooks employed.

In order to gather data concerning this measure, it was necessary to carefully define terms. Chefs were defined as trained or skilled chefs/cooks, involved with the full production of meals within the large N.H.S hospitals or four/five star hotels. A meal was defined as traditionally recognised within the hotel and catering industry as a complete menu item for breakfast, lunch and dinner - not a snack or afternoon tea. Although from the case studies it was recognised that variances occurred, on the whole, an eight hour shift was defined by the chefs/cooks as a working day. To confirm accuracy of chefs/cooks employed, for the purpose of the quantifiable analysis of the questionnaire, part-time staff were 'converted' to full-time (on the basis of two part-time being equivalent to one full-time). Ancillary staff were not included or asked for within this data.

Though this may be criticised as being inexact in terms of both time and numbers employed, follow up research showed that in fact the conversion of part-time to full-time was overall reasonably representative. Any shortfall in individual response accuracy, was also more than compensated by the high number of responses which resulted from requesting information in a manageable format. The advantage of regression analysis, in smoothing out deviations is also beneficial, when a sufficiently large data set is obtained, as in this case.

Researching this information elicited the provision of quantified data regarding assessment of different food production and catering technology operations productivity levels.

Measurement of productivity by a regression model also differs from the usual published numerical text. A regression model offers definite advantages. For a further explanation - please refer to Section 5.7 (Productivity Data) and Section 6.2 (Productivity)

There are limitations within this m/c/d quantitative analysis (no doubt similar to manufacturing numerical research). For example there is no account of quality assessment of food, also other productivity parameters such as food cost and capital cost are not included in this analysis. The variable of the 'chef' also represents a range of different skill levels. A chef in one unit may not be directly comparable to a chef in another. As already stated regression analysis, to an extent, smoothes out some of the variations resulting from this. However these areas could be developed in a further assessment.

Based on this thinking a questionnaire was designed and piloted to a small number of organisations. After further consultation with these units, the original draft was modified in the light of their responses. These modifications revolved primarily around the understanding of terminology. The final draft and layout removed identified ambiguity for ease of use for the respondent and to enable more effective computer analysis of the data. The questionnaire utilised can be found in Appendix II.

5.4 The Response

Return of postal questionnaires sent off:

170 hotels	-	90 returned	=	52.9%
90 hospitals	-	61 returned	=	68.0%

This constituted a highly satisfactory rate of return. Inspection of non-responders revealed no bias. A wide range of sizes of operation (employing 3-47 chefs) from general to teaching hospitals and hotels (employing 3-80 chefs) within the category of four/five star were contacted. One hospital submitted figures for staff numbers and number of meals produced per day that fell more than three standard errors outside the average. After contacting the hospital it appeared they had listed all the catering equipment from all the hospitals within the group and the meals being produced were not on a conventional menu cycle. Therefore this one hospital was eliminated leaving a sample of 60 hospitals.

The questionnaire requested information on the number of chefs employed, (if part-time chefs employed these were doubled up) the number of meals per day produced, the food production system used (traditional cook-chill and use of pre-prepared vegetables) as well as the number of items of equipment of each type available. Unfortunately there is some evidence that this last question failed to distinguish between items of equipment in regular use and those available but not regularly used. Hospitals and hotels with recently installed high productivity systems could, for example, have equipment available but not in use. Their true productivity level would tend to be understated. (Cook-freeze was not pursued as a production system this particular catering system had been researched earlier).

Hospitals and hotels participating in the survey were separated into sub groups according to their responses to questions, their use of pre-prepared vegetables, cook-chill, traditional systems and the number of items of equipment available for use. The use of pre-prepared vegetables was assessed with three questions asking what percentage of potatoes, chipped potatoes and fresh vegetables used were purchased pre-prepared. The responses to these questions were added (giving a range of possible totals from zero to 300 percentage points) and respondents split into two groups of heavy users of pre-prepared vegetables whose total was 249 or more (38 hospitals, 39 hotels) and light users of pre-prepared vegetables whose total was less than 250 (22 hospitals, 51 hotels).

The use of cook-chill was assessed with three questions asking respondents to classify their operations as being "conventional", "partial cook-chill" or "full cook-chill". Two groups of respondents were identified, those not using cook-chill at all (39 hospitals, 70 hotels) and those with partial or full cook-chill systems in place (21 hospitals, 20 hotels).

5.5 Items of Equipment Used

The equipment used in hospitals and hotels was extensively reviewed with questions determining the number of each type of equipment used. For each type of equipment further questions determined the perception of the responder as to its effect on productivity, the working environment and whether it is labour saving. The hospitals and hotels were divided into two groups, those using more than 16 items of equipment per 1,000 meals per day (35 hospitals, 39 hotels) and those using less (25 hospitals, 51 hotels).

To establish the type of catering equipment being used, the information gathered from the questionnaire was calculated on spreadsheets under the various headings of type of equipment, and whether the user perceived these as being productive, labour saving and the extent it improves the working environment. From this first analysis the total number of users from the spreadsheet was then fed into the software package (Instalcal) to obtain the bar charts and analysis to be found in appendix four. A summary of the equipment as a percentage of usage and reasons for use follows diagrammatically in Figure 5.1

Figure 5.1 SUMMARY OF EQUIPMENT UTILISATION AND REASONS FOR USE

	TYPE OF EQUIPMENT	ONE OR MORE		REASONS FOR USE					
				IMPROVED ENVIRONMENT		IMPROVED PRODUCTIVITY		LABOUR SAVING	
		HOTEL	HOSPITALS	HOTEL	HOSPITAL	HOTEL	HOSPITAL	HOTEL	HOSPITAL
		%	%	%	%	%	%	%	%
1	Convection ovens	87	89	71	68	92	79	67	53
2	Conventional ovens	91	69	34	27	34	27	21	26
3	Combi ovens	55	47	87	98	96	98	84	94
4	Conventional fryers	90	80	33	10	53	27	42	25
5	Cool zoned fryers	12	25	72	76	82	92	64	52
6	Computerised fryers	5	0	70	0	90	0	90	0
7	Combination microwaves	20	6	77	67	73	67	69	67
8	Ordinary microwaves	80	75	59	65	55	52	55	51
9	Pressure steamers	46	70	63	67	87	77	82	67
10	Conventional steamers	42	58	52	9	61	27	64	21
11	Bratt pans	68	83	53	54	81	76	79	90
12	Boiling kettles	39	80	58	36	71	61	64	51
13	Grill	96	93	47	29	52	32	36	32
14	Chargrills	65	4	45	50	58	4	43	50
15	Griddles	41	19	49	26	68	47	50	53
16	Chillers	65	76	87	77	81	73	86	75
17	Freezer	75	75	25	24	24	17	21	15
18	Food processors	82	59	67	81	85	83	86	85
19	Veg Prep machines	54	59	57	66	74	93	74	98
20	Bowl choppers	34	22	50	72	70	41	27	17
21	Vacuum packers	30	4	76	50	83	50	76	50
22	Induction hobs	22	5	82	80	64	40	59	40
23	Halogen hobs	8	0	61	0	49	0	38	0

5.6 Summary of Equipment Utilisation (Figure 5.1)

A detailed discussion of equipment is given in Appendix III. Below is a summary of major points.

Row 1, 2,3 - Convection ovens, Conventional ovens, Combi ovens

Although the number of combi ovens in use (Row 3) is small compared with conventional or convection ovens, the hotels and hospitals using them agree strongly that they effectively improve the environment and productivity and are a labour saving apparatus. These factors are highly significant for future equipment purchase.

Row 4,5,6 - Conventional fryers, cool-zoned fryers, computerised fryers

Although cool-zoned fryers (Row 5) are not new, they are strongly recommended for improving productivity, since they prevent spoilage and discoloration of food and prolong the life of the oil/fat (as burnt particles of food drop beneath the heating elements).

Row 7,8 - Combination microwaves, ordinary microwaves

Microwaves are used throughout the hotel and catering industry, mainly to reheat or thaw food items, rather than as a complete method of cooking. Their capacity to hold and cook food in large quantities is not practicable.

Row 9,10 - Pressure (and pressure-less) steamers, conventional steamers

Pressure/less steamers receive a strong recommendation from users as an aid to productivity through speed of cooking and good temperature and timing control. This is compared to the conventional steamer, with its generation of surplus steam, which can also be a safety hazard.

Row 11 - Bratt plans

These are viewed by the hotel/hospital chef as an item of equipment which is labour saving, as many portions of food can be cooked simultaneously. This is also an aid to productivity with its speed of cooking and temperature control.

Row 12 - Boiling kettle

The boiling kettle is mainly used within hospital catering for bulk production, but it is versatile in its production of soups, sauces or vegetable cooking, which is also of benefit to hotel chefs.

Row 13 - Grill

The grill is a unique piece of catering equipment, seen as contributing little to environmental improvement or saving of labour, but necessary within any catering kitchen. It provides a fast method of cooking or browning foods for immediate service, and possibly under-valued on this respect.

Row 14,15 - Chargrills, griddles

Mainly used for specific items on an a la carte menu; therefore mostly found within hotel kitchens.

Row 16,17 - Chillers, freezers

Universal apparatus that is essential and used by chefs throughout the industry to aid storage of raw or cooked commodities.

Row 18,19,20 - Food processors, Vegetable preparation machines, Bowl choppers

Similar catering apparatus used as labour saving equipment and seen as an aid to improving productivity.

Row 21 - Vacuum packer

Mainly used in hotels, enabling the chef to store food items packed in plastic pouches for better storage, and then chilled for later use.

Row 22,23 - Induction hobs, Halogen hobs

Although the induction hob is used by few establishments, it is interesting to note that both hotels and hospitals emphasise the importance of the induction hob in improving the work environment. This also applies to the halogen hob, although its use is limited to hotels. It would seem that if these hobs can be reduced in price and made more accessible for batch cooking, there will be a demand for them in saving energy consumption and to enable staff to work in a better environment.

5.7 Productivity Data

As found in the literature review, productivity can be calculated in various forms from the manufacturing volume process, to time and motion to assess staff productivity. From the data obtained from the questionnaires the figures are calculated as meals produced/per day/per chef. As Hospital and Hotel chefs assess productivity as total meals produced each day, not by the hour.

As reflected in Section 3, Adam and Ebert (1986) and McFarland (1975) confirm that the most utilised measure of labour time in food service is meals served per man-hour. Figure 3.1.7 average labour productivity in a hospital kitchen 15.63 patients meal/labour/hour. Ruf and Donaldson (1975) Section 3 maintain that over production and underproduction result in substantial cost increases.

Productivity can be measured as the number of meals produced per day, on average by each full-time (part-time chefs if any, grouped as a whole) chef (m/d/c). If this is calculated for each questionnaire by dividing the number of meals by the number of chefs, a wide range of values is obtained with a minimum of 38 m/d/c to maximum

550 m/d/c per hospital chef with an average of 158 m/d/c. This type of calculation demonstrates considerable spread as the standard deviation for a single measurement is 94 m/d/c with the standard error of the mean 12 m/d/c.

Hotel chefs produce on average 35 m/d/c with a minimum of 9 m/d/c to maximum of 167 m/d/c. With this type of calculation the results demonstrate a considerable spread within the data as the standard deviation for a single measurement is 23 m/d/c with the standard error of the mean 2 m/d/c.

The results of this analysis are reported in Figure 5.2 and 5.3 - To facilitate comparisons between the sub groups a column showing the number of meals produced by 20 chefs in a day has been added. The sub groups are those derived according to the analysis set out on page 142.

Figure 5.2 - Productivity of hospital kitchens

(meals per day per chef (m/d/c) by calculation)

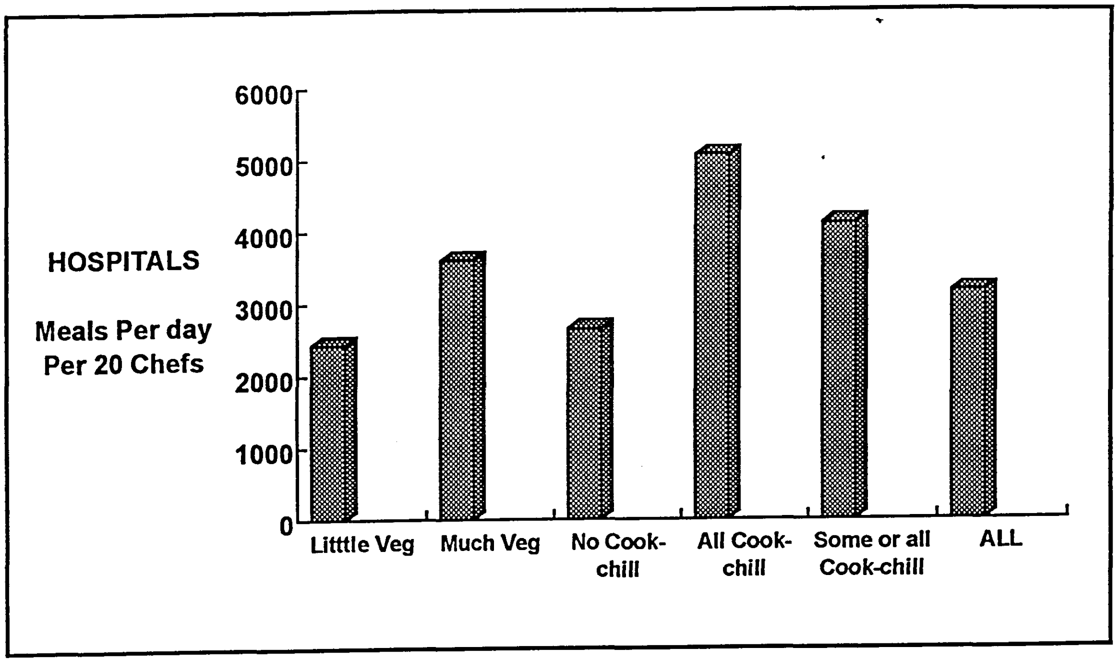
	number	m/d/c	m/d/20 chefs (see Figure 5.4)	95% confidence limits (m/d/c)
ALL	60	158	3166	±188
Many equip	35	113	2252	±101
Few equip	25	218	4363	±210
little veg	22	122	2434	±103
much veg	38	180	3600	±214
No cook-chill	39	133	2653	±126
All cook-chill	9	253	5060	±256
Some or all cook-chill	21	206	4120	±246

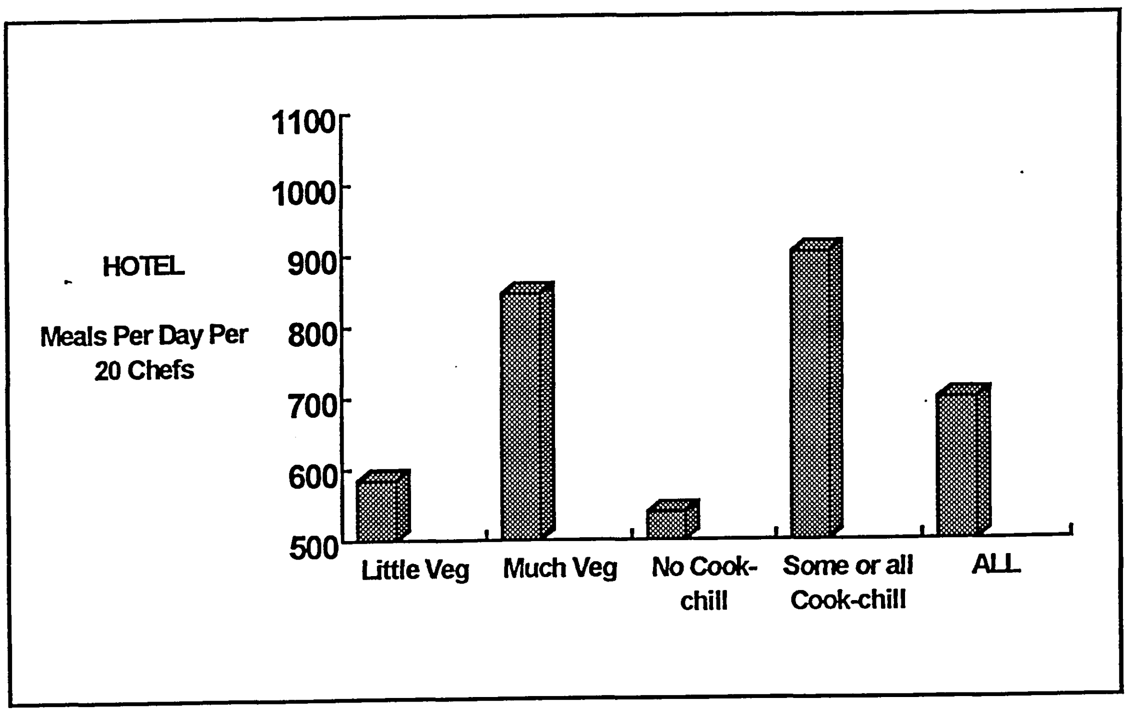
Table 5.3 - Productivity of hotel kitchens

(meals per day per chef (m/d/c) by calculation)

	number	m/d/c	m/d/20 chefs (see Figure 5.5)	95% confidence limits (m/d/c)
ALL	90	34.9	698	±45
Many equip	65	28.1	562	±28
Few equip	25	52.5	1050	±61
little veg	51	29.2	584	±33
much veg	39	42.3	846	±55
No cook-chill	70	31.9	538	±32
Some or all cook-chill	20	45.2	904	±73

Table 5.3 a-b Productivity of 20 Chefs Hospital and Hotels





An alternative method of representing the m/d/c is to use the regression analysis (see graphs 5.6-28) which effectively plots a graph of the number of staff employed against the number of meals produced per day. The basic assumption behind the analysis is that each chef contributes a certain number of meals per day: the expectation is that the line will pass through the origin (zero meals produced by zero chefs), i.e. the intercept should be zero. This ideal is not achieved but in most cases the intercept is acceptably small compared with the total number of meals being produced. As the straight line model is based on an intuitively correct assumption it was retained as the main method used for interpreting the data. That the line fails to pass through the origin is not unexpected. These hospitals and hotels employing large numbers of staff do so because they are not using methods of production that give high productivity - the right hand side of the graph (hospitals and hotels with few staff), of necessity use highly productive techniques raising the points above expectation. This rotates the line the best fit clockwise giving a positive intercept, as was observed in all but three sub-groups; one of which contained only four hotels and must be discounted as it failed to show a significant relationship within this small group.

5.8 <u>The results of this analysis are reported in Tables 5.4 and 5.5 which show:</u>

Column 1: Number of respondents in the group analysed into different categories.

Column 2: Reports the correlation coefficient for each group, a perfect relationship between number of staff and number of meals would give a correlation coefficient (corr.coeff) of plus or minus 1. A correlation coefficient near to zero would indicate that there was no relationship between the number of staff and number of meals. The level of significance is measured by "p": where a value of $p=0.05$ or less (5%) is generally considered significant. The significance of each relationship is given on each graph as "sig.".All are highly significant with $p<0.02$ and in most cases $p<0.001$.

Column 3: Gives the intercept which is equal to the number of meals produced by number of staff, this is generally not far enough away from zero to invalidate the model.

Column 4: Reports the slope of the regression line which on this model is equal to the m/d/c. Because the intercept is sometimes different from zero a clearer comparison of productivity within each group of hotels and hospitals can be obtained by calculating the number of meals that would be produced by 20 chefs this is done from the model:

meals/d = m/d/c (slope) x number of chefs + intercept

using the slope and intercept for each group.

The last column gives the 95% confidence limits, small values give greater confidence in the value reported. In order to facilitate comparison between the two sets of numbers, the number of meals per day produced by 20 chefs has been calculated in each table. In Figure 5.2/3 this is twenty times m/d/c. For Figure 5.4/5 the slope m/d/c must be multiplied by 20 and the intercept added (or subtracted in the case of the negative intercept). The figures for hotels and for hospitals are very similar except in the case of the groups using many items of equipment. In these cases the correlation coefficient is lower than average and the confidence limits from Figure 5.2/3 are higher than average indicating that this group encompasses a wide range of productivities making estimation of the average prone to error. Nevertheless, the figures from the regression analysis are very useful as they give a better estimate of the increase in production that could be expected from additional staff or a reduction in staff employed in an existing operation.

Figure 5.4 - Productivity of hospital kitchens

(meals per day per chef (m/d/c) by regression analysis)

	No.	Corr coeff	Intercept	Slope	Meals produced by 20 chefs	95% confidence limits (m/d/c)
ALL	60	.60	101	145	3001	±50
Many equip	35	.51	439	131	3059	±76
Few equip	25	.47	241	114	2521	±90
Little veg	22	.67	100	113	2360	±56
Much veg	38	.67	-143	186	3577	±70
No cook-chill	39	.71	-255	154	2825	±50
All cook-chill	9	.79	40	224	4520	±130
Some or all Cook-chill	21	.54	415	155	3515	±110

Figure 5.5 - Productivity of hotel kitchens

(meals per day per chef (m/d/c) by regression analysis)

	No.	Corr coeff	Intercept	Slope	Meals produced by 20 chefs	95% confidence limits (m/d/c)
ALL	90	.74	183	20.75	597	±4
Many equip	39	.77	205	20.2	609	±5
Few equip	51	.42	155	22.6	607	±14
Little veg	51	.70	151	18.4	519	±5
Much veg	39	.80	244	22.7	698	±5
No cook-chill	70	.77	158	19.5	548	±4
Some or all Cook-chill	20	.73	273	24.6	765	±11

5.9 Productivity of Hospital Catering

Food production within hospital catering may be explained as a food flow system (i.e. from buying in commodities to feeding the patient) mainly concerned with the processing of raw, semi-prepared, or prepared food items. The resulting product may be in a ready-to-serve state, for example in the traditional method (cook-serve), or it may undergo some form of preservation, cook-chill, before being served to the patient. Hospital caterers strive to provide patients with meals high in quality and nutritional value and free from food contamination. Whether a traditional trolley service or cook-chill system is in operation, strict budgetary control is used by all catering managers.

Types of Hospital Production Systems

The catering manager must establish a food production system which meets these objectives at a reasonable operating cost. Although each hospital's unique needs form the criteria for selecting an appropriate production system, the requirements of space, equipment and labour costs are of utmost importance. The capital resourcing of these requirements varies depending on the age and size of the hospital, the choice of menu and the production system. Within the National Health Service hospital catering operations, a variety of production methods are being used from:

A. Traditional cook-serve

(all menu items pre-prepared and cooked for immediate consumption)

B. Cook-serve with partial cook-chill

(as above with some menu items being cooked-chilled for later use)

C. Full cook-chill

(all menu items prepared and cooked-chilled stored for later use at 3°C

D Cook-freeze/thaw

(all items purchased from food manufacturers - assembled, portioned, thawed, regenerated, for the hospital patient)

This production system became apparent after the questionnaires had been returned as noted in 5.4. The hospital and the wholesaler concerned (Brake Broth's) were visited and subsequently realised that cook-freeze thaw could not be incorporated within the framework of this research but could constitute interest for further work.

<u>Analysis of sample menu</u>

The following data analysis from the survey will show the key issues in hospital productivity are:

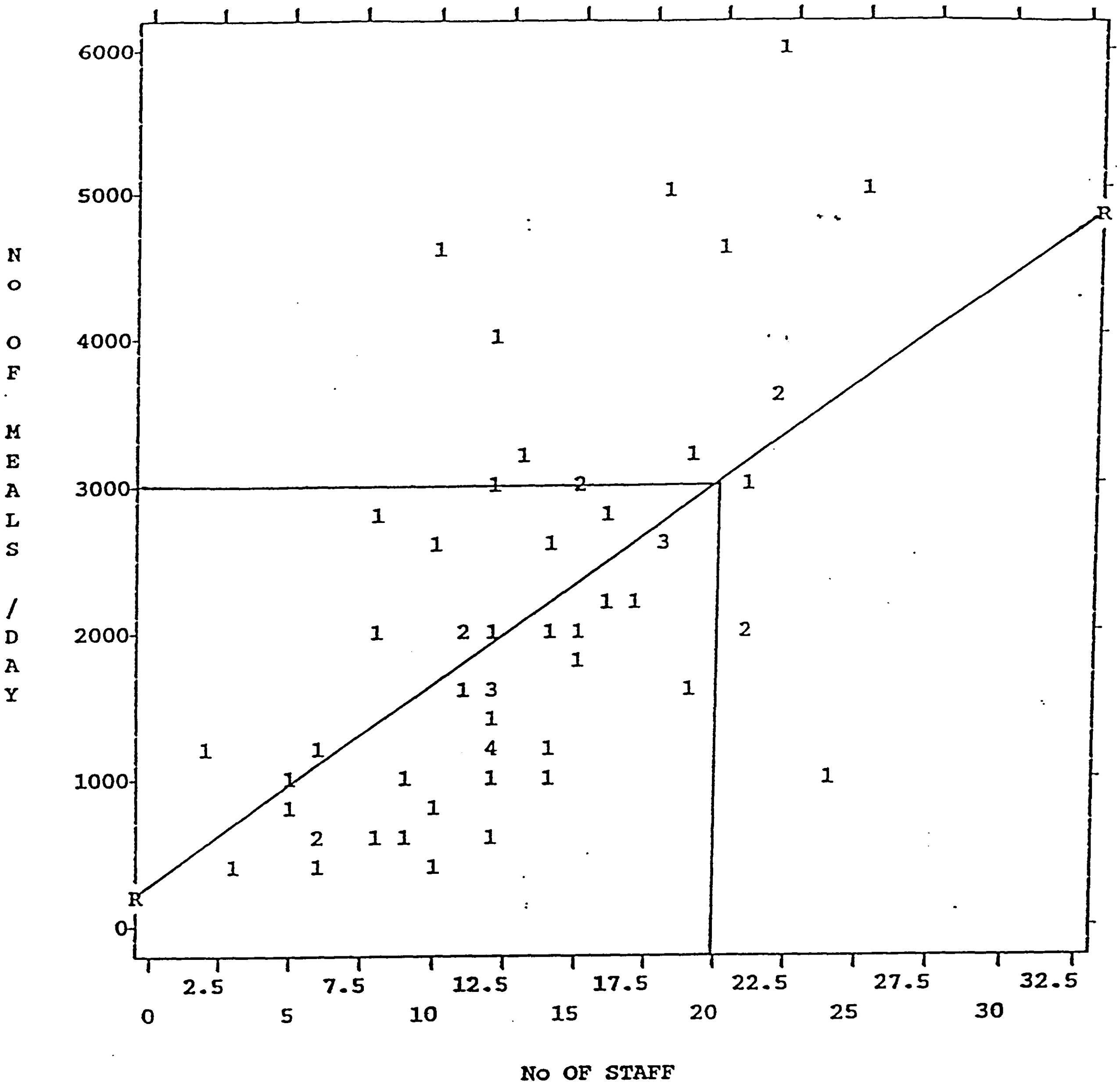
a) use of pre-prepared vegetables

b) cook-chill

c) possible number of items of catering equipment used to achieve an overall saving

d) staff productivity.

From the information gathered from various hospitals a typical lunch menu has been produced (Figure 5.6) that offers a choice of dishes that could be used either in a traditional or cook-chill production system. From the data the middle range of 3,000 meals per day has been used to calculate the number of staff needed to produce this number of meals both by the traditional (20 staff) and cook-chill (12 staff) system of production. It is also possible to calculate the benefits of using pre-prepared vegetables to increase productivity.



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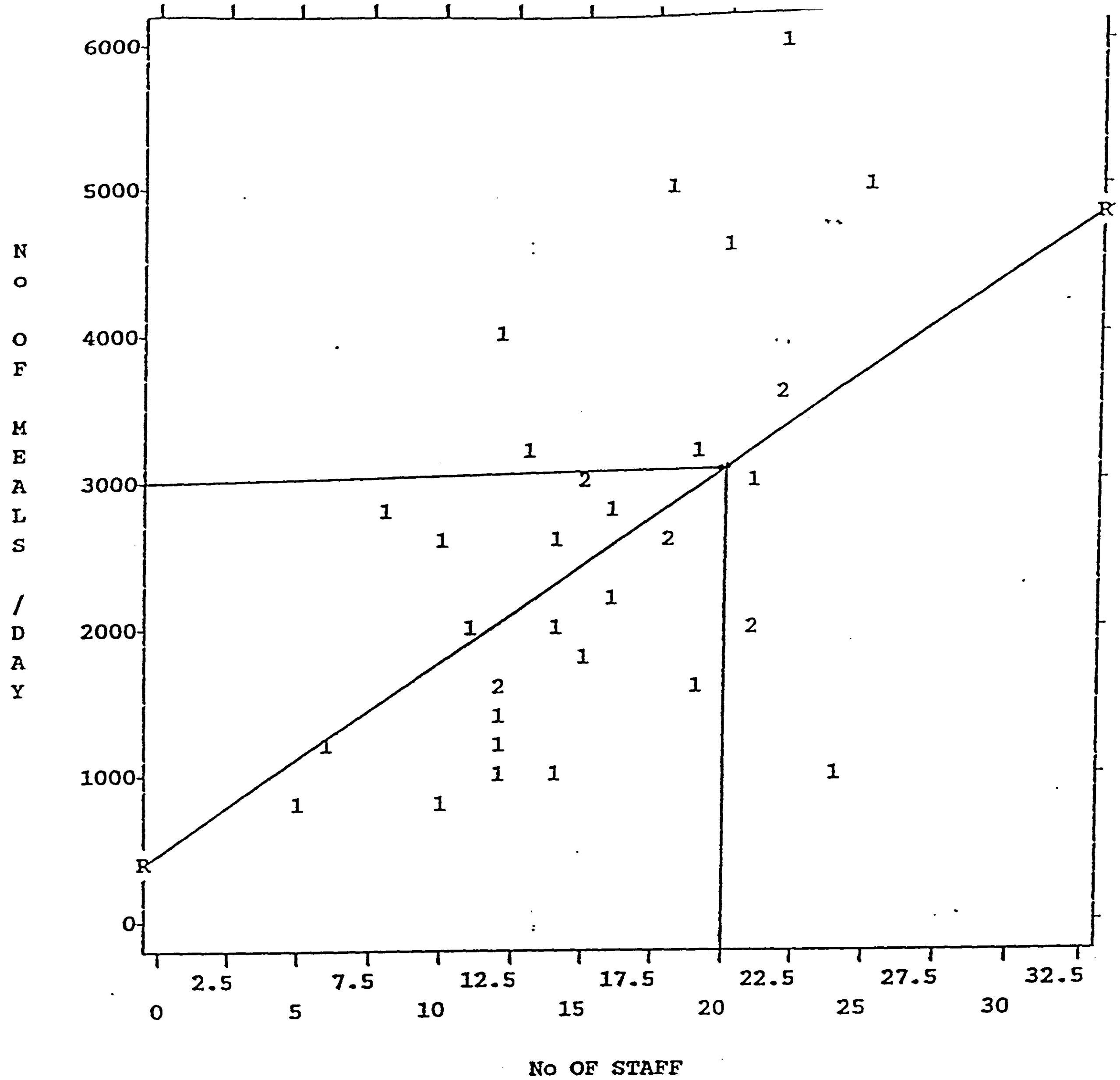
60 cases plotted. Regression statistics of Q2 on Q3:
Correlation .60408 R Squared .36491 S.E. of Est 1032.46630 Sig. .0000
Intercept(S.E.) 100.68697(359.43906) Slope(S.E.) 145.25475(25.16166)

Hospitals only

The data shows that on average that 20 hospital chefs produce approximately 3,000 meals, per day. The number of chefs employed varies from 2-25 within hospitals producing from 400-6,000 daily meals. Menu planning is usually on a menu cycle, because of the large numbers produced it would be impossible to offer each patient a free choice but the majority of menus offer a substantial choice, from traditional to a cook-chill production system.

Graph 5.6



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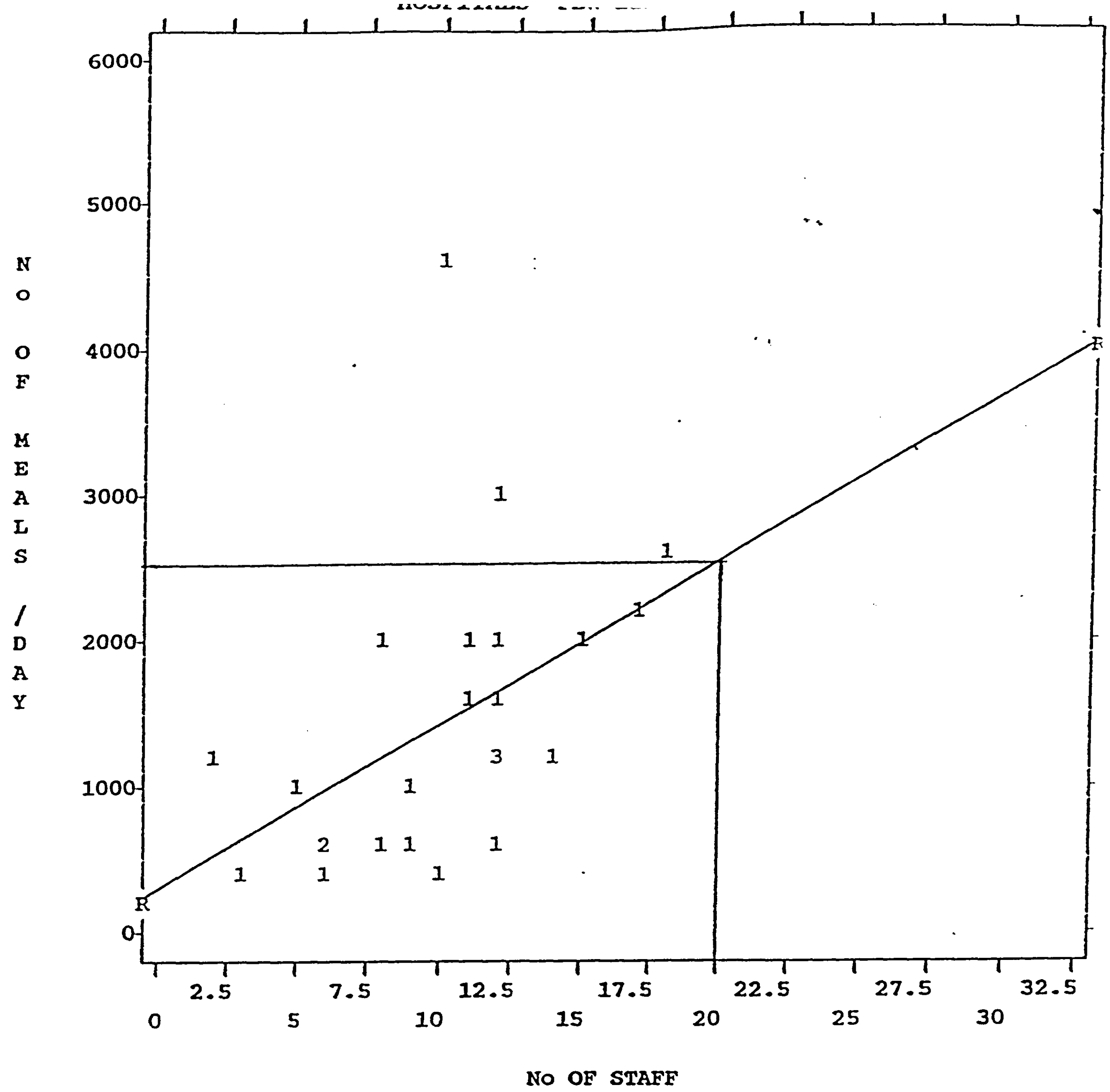
35 cases plotted. Regression statistics of Q2 on Q3:
Correlation .51219 R Squared .26234 S.E. of Est 1131.13757 Sig. .0017
Intercept(S.E.) 439.59255(626.39923) Slope(S.E.) 131.47658(38.37815)

<u>Hospitals - many items of equipment</u>

From the questionnaires it has been difficult to ascertain an exact amount of equipment being used, as the majority of hospitals listed all the catering equipment on site even though no doubt many items are not used at the same time for each production run. Possibly some items are no longer used. It can be assessed from the questionnaires that on average 28 items of production equipment could be required to produce 3,000 meals per day. 20 chefs produce 3,100 m/d.

Graph 5.7



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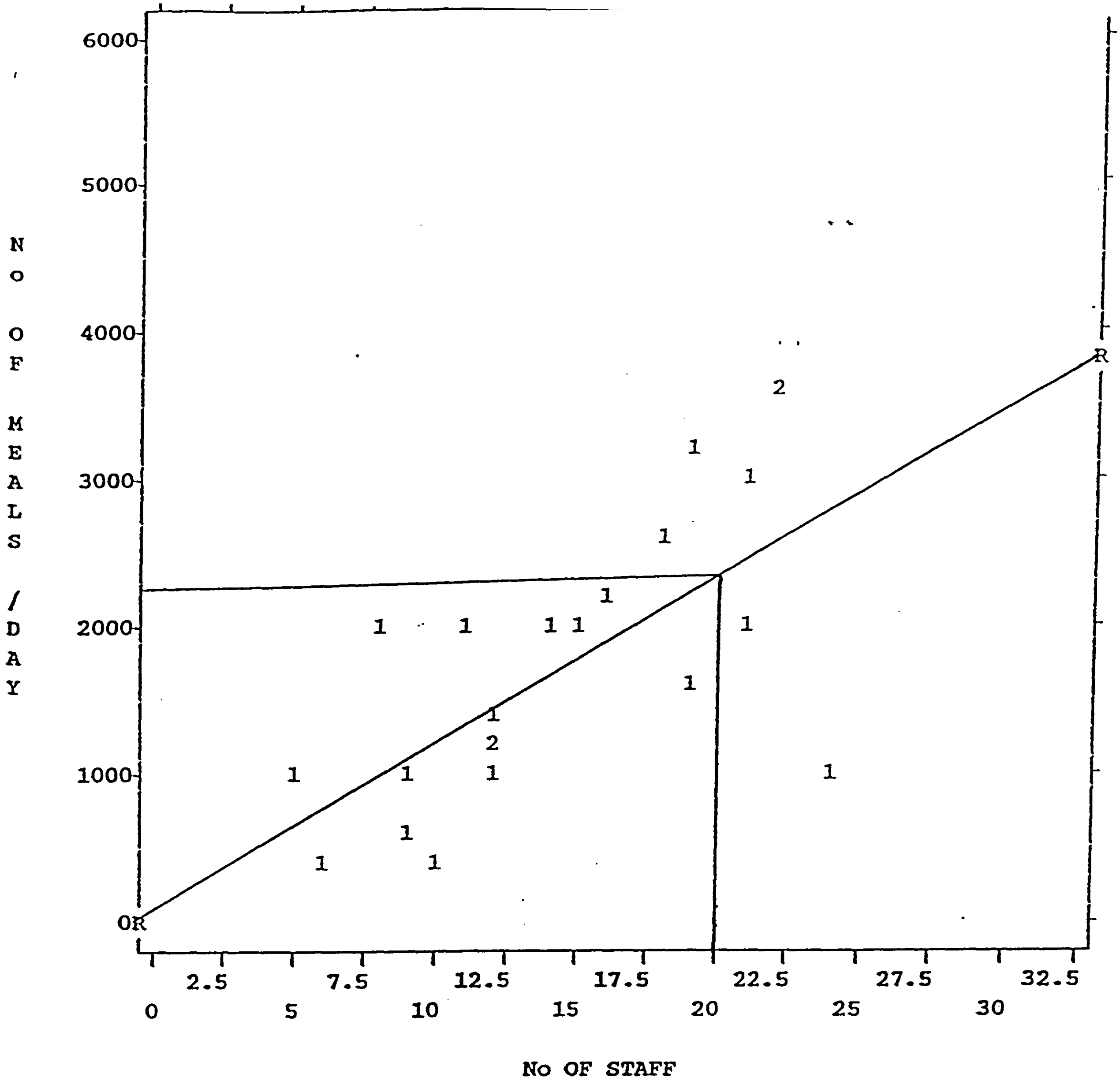
25 cases plotted. Regression statistics of Q2 on Q3:
Correlation .46626 R Squared .21740 S.E. of Est 878.74900 Sig. .0188
Intercept(S.E.) 241.40270(487.28824) Slope(S.E.) 113.96799(45.08837)

<u>Hospitals - few items of equipment</u>

Hospitals using fewer items of equipment per 1,000 meals per day were found to be slightly less productive, Table 5.3, than those using more equipment but this difference was small. In Table 5.2 (by calculation) the reverse is shown to be the case.

Graph 5.8



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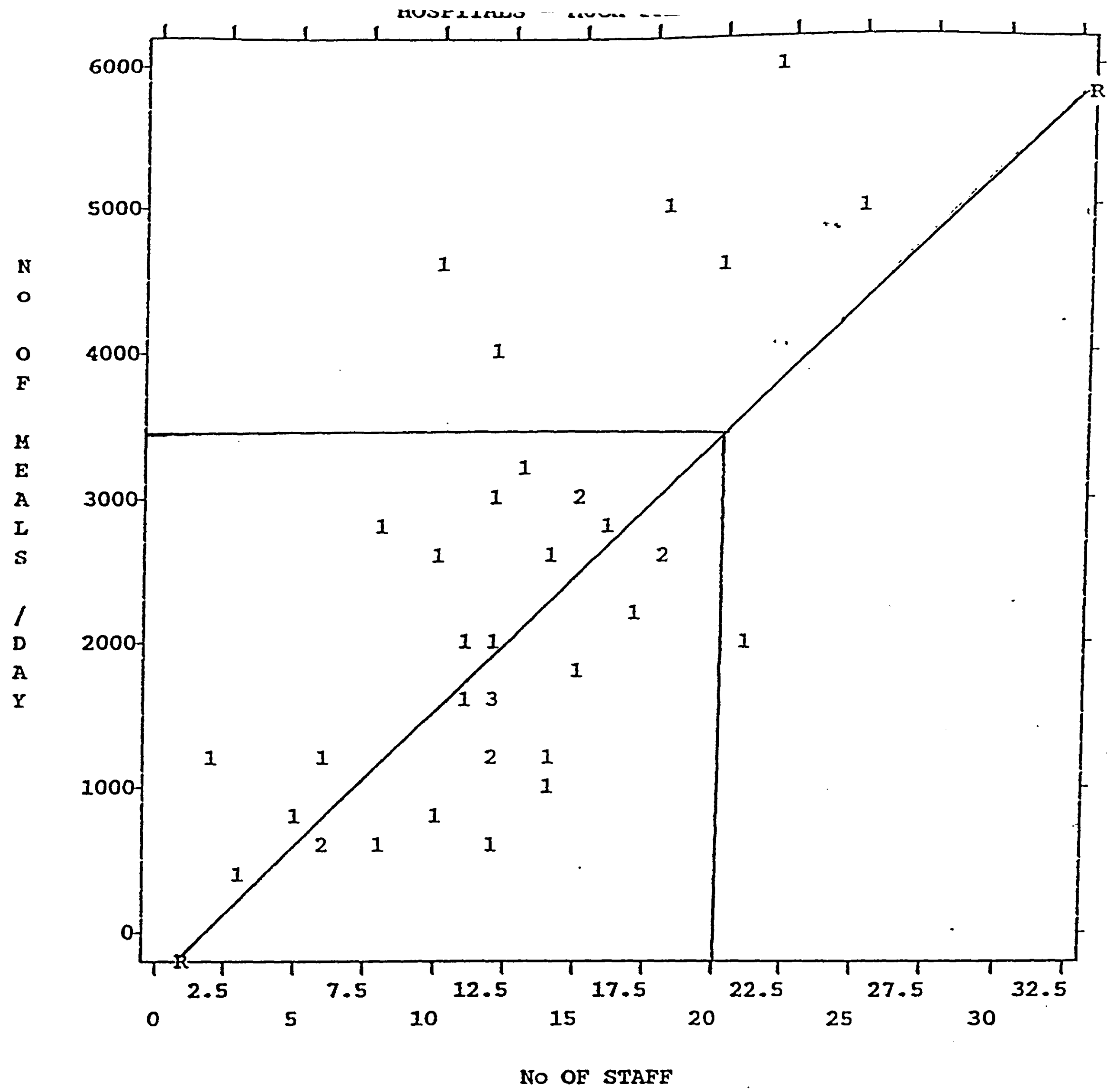
22 cases plotted. Regression statistics of Q2 on Q3:
Correlation .67409 R Squared .45439 S.E. of Est 716.86315 Sig. .0006
Intercept(S.E.) 99.58837(428.63300) Slope(S.E.) 113.42604(27.79211)

<u>Hospitals - little pre-prepared vegetables</u>

Most hospitals (82% in the survey report at least 50% of vegetables are bought ready prepared) already use pre-prepared vegetables extensively, clearly the extra cost is seen to be justified by the increased productivity. Another aspect would be to avoid the prevention of earth brought in on fresh vegetables that could possibly cause cross-contamination within the storage or preparation area.

Graph 5.9



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38 cases plotted. Regression statistics of Q2 on Q3:

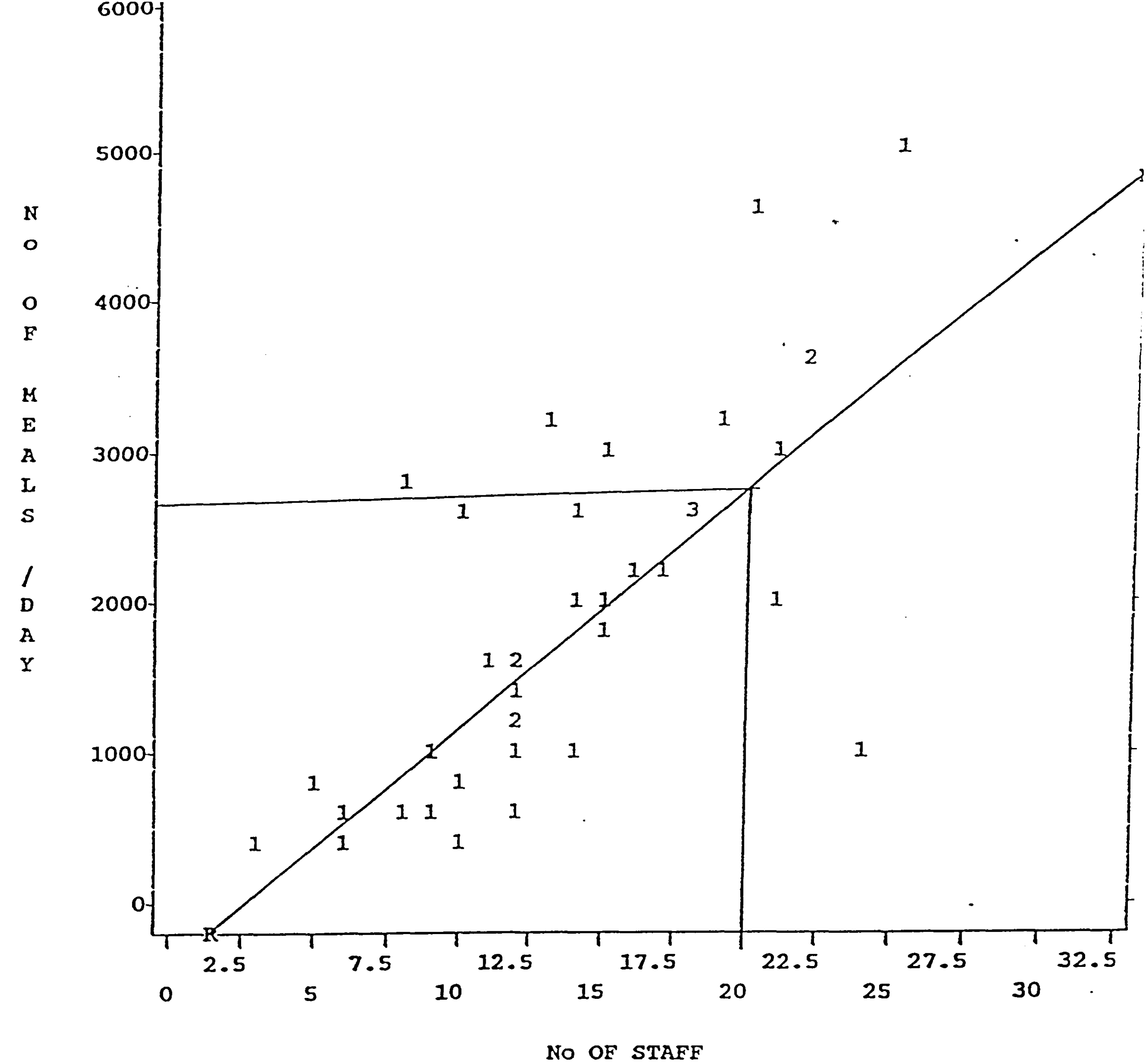
Correlation .66683 R Squared .44467 S.E. of Est 1079.31340 Sig. .0000

Intercept(S.E.) -143.80385(469.97171) Slope(S.E.) 185.76523(34.59980)

Hospitals - much pre-prepared vegetables

Using pre-prepared vegetables it is possible to increase productivity by approximately 50% when compared with Graph 5.9 - little pre-prepared veg. This shows that by using pre-prepared vegetables a substantial saving could be made against labour costs, and time, when compared with traditional veg prep or minimal purchase of pre-prepared veg. A significant increase in productivity from such a simple change of practice.

Graph 5.10



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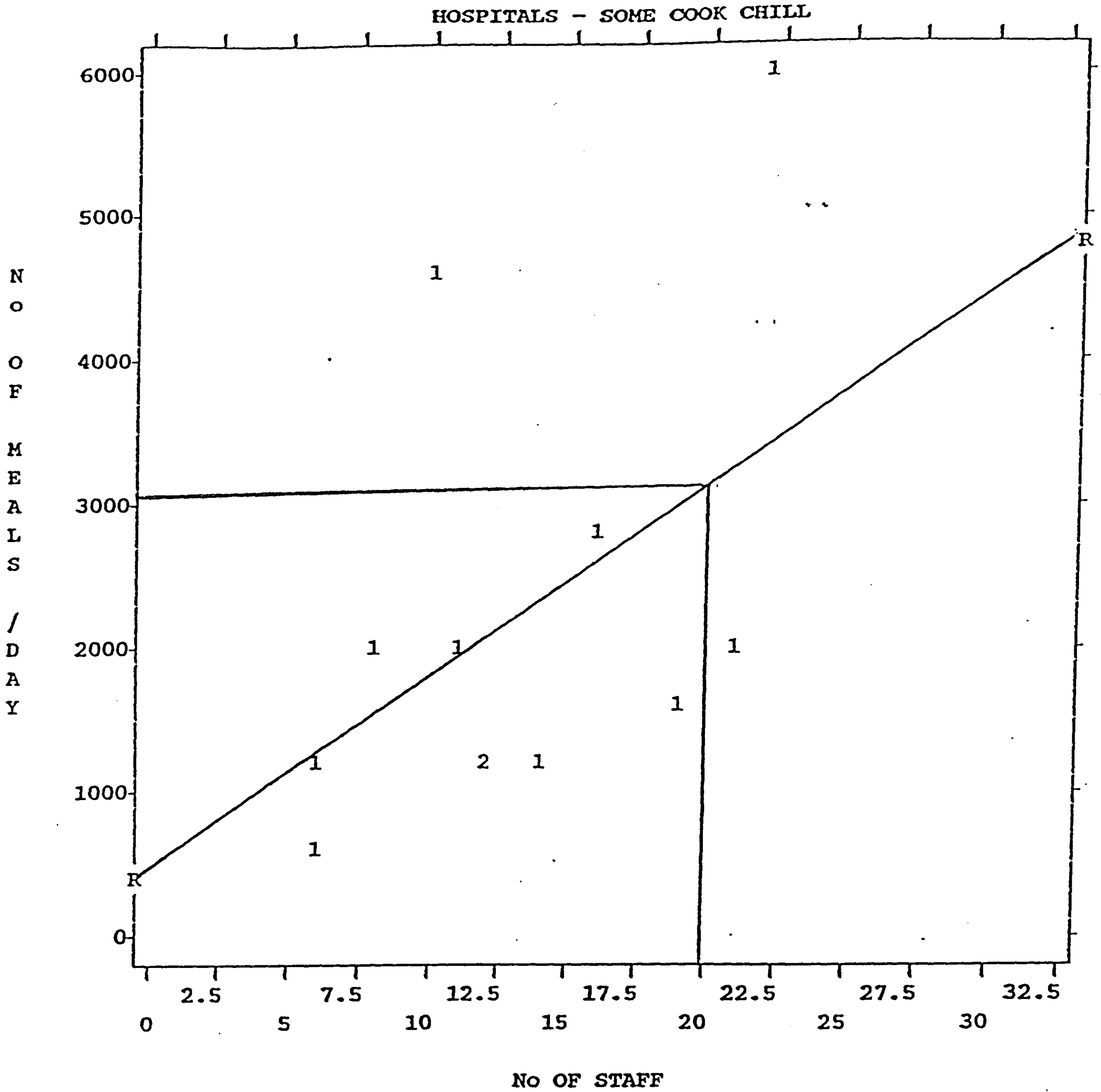
39 cases plotted. Regression statistics of Q2 on Q3:
Correlation .71534 R Squared .51172 S.E. of Est 824.29312 Sig. .0000
Intercept(S.E.) -255.89139(367.25183) Slope(S.E.) 154.12734(24.75146)

Hospitals - no cook-chill

From this data it shows that a hospital using a traditional cook-serve production system, 20 chefs on average produce 2,825 meals per day, compared with 20 chefs producing 4,520 meals per day in a cook-chill operation. See Graph 5.13

Graph 5.11



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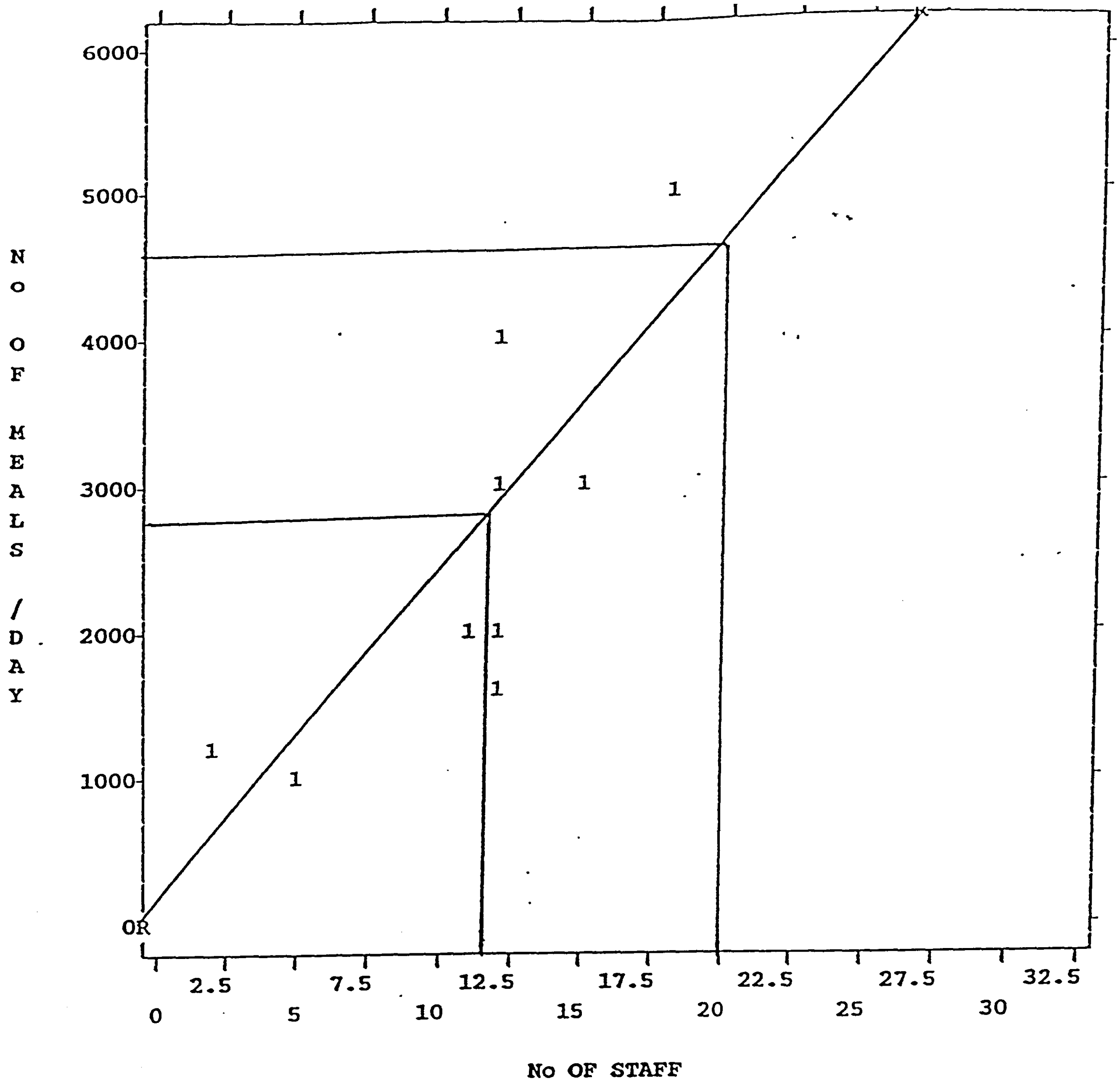
12 cases plotted. Regression statistics of Q2 on Q3:
Correlation .47276 R Squared .22351 S.E. of Est 1473.39498 Sig. .1206
Intercept(S.E.) 356.27439(1144.8475) Slope(S.E.) 137.83253(81.24119)

<u>Hospitals - some cook-chill</u>

As the relationship was shown to be not significant (P=0.12) in this sub-group these results were not used and the hospitals in this sub-group were grouped with "all cook-chill" to give a composite sub-group "Some or all cook-chill". (Graph 5.14).

Grap 5.12



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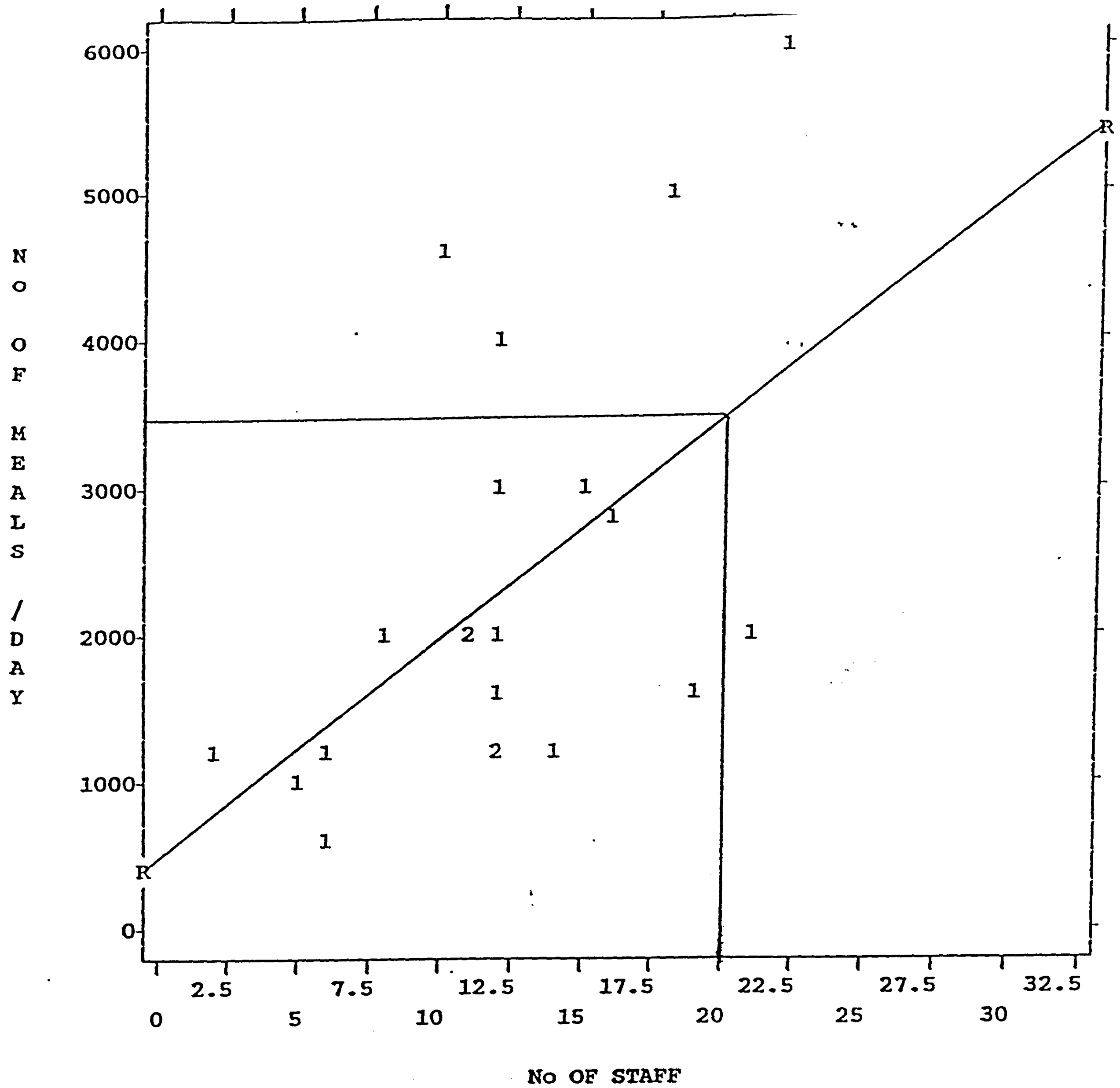
9 cases plotted. Regression statistics of Q2 on Q3:
Correlation .79234 R Squared .62781 S.E. of Est 887.68672 Sig. .0109
Intercept(S.E.) 39.78495(774.70630) Slope(S.E.) 223.65591(65.08835)

Hospitals - cook-chill

The graph shows that the average meal production is 4,520 meals/20 chefs. Between the two systems, i.e. traditional Graph 6 and cook-chill Graph 8 there is a difference of nearly 1700 meals increase in productivity.

This emphasises that on average 20 chefs produce 2,825 meals when using traditional production systems (Graph 5.11 no cook-chill) compared with 12 chefs producing the same number of meals when using cook-chill, Graph 5.13. Certainly this shows a saving on labour costs can be obtained to offset the capital expenditure required to install a cook-chill production system.

Graph 5.13



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21 cases plotted. Regression statistics of Q2 on Q3:
Correlation .54562 R Squared .29770 S.E. of Est 1266.18845 Sig. .0105
Intercept(S.E.) 415.58500(720.98651) Slope(S.E.) 155.03014(54.62796)

Hospitals - some or all cook-chill

It was necessary to combine the above responses from industry to achieve the slope shown (155 m/d/c) as the data on some cook-chill Graph 5.12was discarded. (No "sig." value) In this sub group 20 chefs produced 3,515 m/d/c compared with 4,520 for full cook chill hospitals and 2,825 using traditional methods.

Graph 5.14

Figure 5.15

Lunch Menu (Hospital

Tomato Soup

Melon Cocktail

Soused Herring Salad

****

Fricassee of Chicken with Rice

Grilled Pork Chop and Apple Sauce

Vegetable Lasagne

Carrots and Peas

Buttered Broccoli

Sauté Potatoes

****

Apricot Flan and Custard

Bread and Butter Pudding

Chocolate Mousse

****

From the above menu for a 3,000 bed hospital it is possible to assess the appropriate number of staff and equipment needed and with the use of pre-prepared vegetables a production control system could be drawn up, ascertaining whether a traditional or a cook-chill production system is more beneficial to the hospital caterer.

(See Graph 5.11 and Figure 5.4 hospitals no cook-chill compared to Graph 5.13 and Figure 5.4 hospitals cook-chill).

Figure 5.16 Starters Production Schedule HOSPITALS

Tomato Soup
Melon Cocktail
Soused Herring Salad

STAFF	Cook-Chill	Traditional Production
	12 TOTAL	20 TOTAL X 3,000 MEALS
8 am	ITEM PREPARED FOR COOK CHILL 3 DAY STORAGE 2 Staff	Soup Preparation 1 Staff
9 am		Soup Cooking
10 am		Fish Salad Preparation 1 Staff
		Melon Preparation 1 Staff
11 am	Plated Ganymede	Soup cooked Meal items Plated Ganymede
12 noon	Trolley Regeneration on Wards	Trolley's Ward Service
Equip-ment Used	Boiling Kettles Hobart Mixer Prep Areas Chiller	Boiling Kettles Hobart Mixer Prep Areas Refrigeration

Approximate Staff Employed - Traditional 3.)
) STARTERS 3,000 Portions
Approximate Staff Employed - Cook-chill 2.)

Figure 5.17 Main Course Production Schedule HOSPITALS

Fricassee of Chicken with Rice
Pork Chop and Apple Sauce
Vegetable Lasagne
Carrots and Peas
Buttered Broccoli
Sauté Potatoes

	Cook-Chill	Traditional	Less Pre-Pre-Prepared Vegetables Trad)	Pre-Prepared Vegetables (C.C.)
STAFF	12 TOTAL	20 TOTAL	20 TOTAL	12 TOTAL
8 am	PREPARATION & COOKING OF COOK CHILLED ITEMS FOR STORAGE 4 Staff	Chicken cooked and sauce made 2 Staff	Potatoes prepared and cooked veg prepared 2 Staff	
9 am		LASAGNA cooked & sauce made 2 Staff	LASAGNA veg cooked 2 Staff	
10 am		Apple sauce made/pureed Rice cooked & chicken diced 2 Staff	Carrots diced	Potatoes Steamed and sliced 3 Staff
11 am		Pork chop grilled, oven cooked, apple sauce heated 1 Staff	Vegetables cooked Potatoes Fried	Vegetables batch cooked Potatoes Fried
11.30 am	Plated meals ganymede	Plated ganymede	Plated ganymede	Plated ganymede
12 noon	Preparation on 70 C	Distributed/ Ward Trollies		
Equipment Used	Pressure/Less Steamer Prep area Boiling Kettles Convection/ Combi Ovens Bratt Pans Regethermic Trolleys	Potato Rumbler Sinks Hobart mixer Boiling Kettles Pressure/Less Steamers Prep Area Convection/ Combi Ovens Bratt Pans Grills, Gastops Ward Trollies		

11 Approx Staff Employed Traditional 7 Approx Staff Employed Cook-chill - Main Course 3,000 portions

Figure 5.18 Sweets Production System HOSPITALS

Apricot Flan
Bread and Butter Pudding
Chocolate Mousse

	Cook-Chill	Traditional
Staff	12 TOTAL	20 TOTAL
8 am	PREPARATION AND COOKING ↓ PROCESS FOR COOK CHILL 3 Staff	Pastry Preparation ↓ 2 Staff
9 am		Flans Baked ↓ Cooled ↓ B/B Pudding Made 2 Staff
10 am		Cooking Process Chocolate Mousse Portioned 2 Staff ↓ Flans Completed Mousse Portioned ↓ Plated/Portioned Ganymede
	Plated Ganymede ↓	Soup Cooked Meal Items Plated Ganymede
12 noon service	Regeneration Ward Service	Distribution Ward Service
Equipment Used	Hobart Mixer Prep Area Convection/ Combi Ovens	Hobart Mixer Prep Area Convection/ Combi Ovens Hot Cupboard Chiller Pastry Roller

Approx Staff Employed For Preparation and Cooking (Traditional) 6
Sweets 3000 portions
Approx Staff Employed For Preparation and Cooking (Cook-Chill) 3

From the production schedules it can been seen that a reduction in staff can be achieved when using a cook-chill production system compared to a traditional cook-serve system.

5.10 Productivity for Hotel Catering

Food production within four/five star hotels is an essential operation as both restaurants and function catering are major as an important revenue earning facilities and it is important that food production and service is of the highest standard.

Chefs can be producing meals for a number of restaurants and functions in any one day. Menus planned can be intricate with a wide selection of sauces being produced to accompany the meat and fish dishes.

Although the necessary mise-en-place would be prepared previously, each dish is normally cooked to order for restaurant service. Special function menu items are cooked in bulk production ready for a specified time. Within several function rooms meals may be produced to cater for 60-1,800 guests or more. It is within this latter area that modern technology such as "cook-chill" is being implemented to incorporate food production of the standard anticipated by the guests; and to maintain productivity and quality control.

Problems occur when guests are late in arriving or pre-lunch speeches are extended, especially under the traditional production system when the food deteriorates as it is kept in hot cupboards at 68°C. With cook-chill production regeneration can be postponed if the guests are late. This helps to maintain the fresh appearance of the food and enhances the meal experience for the guest.

Types of Hotel Production Systems

The food and beverage manager, with the executive chef, must establish a food production system which meets these requirements at an acceptable operating cost. The optimisation of space, equipment and labour are all part of the production management control system; in the attainment of the required profit.

a) **Traditional Cook-Serve**

(All menu items prepared from prime quality fresh ingredients and cooked for immediate food service identified from the five star hotels case studies).

b) **Traditional with Partial Cook-Chill**

(As a), food being produced for immediate à la carte service with some menu items being cook-chilled for special functions for later use).

c) **Full Cook-Chill**

(all menu items prepared cook-chilled, and refrigerated at 3°C for later use for banquets, restaurants and room service operations.

Benefits of the Cook-Chill System

From the function menu produced (Fig. 5.19) from a typical four/five star hotel, I have demonstrated the difference in the number of staff employed within a traditional or partial cook-chill production operation. The menu is the same but because of the cook-chill process production can be spread over the day with less staff employed unlike the traditional production system where more staff are required to produce the same menu for preparation, production and service within one day. Benefits include:

a) A reduction in production staff numbers at the food service period (possibility of 12 to 4 chefs for the regeneration and presentation of food as observed in Case Study 2 (five star hotel).

b) An alleviation of the chefs work load with the use of multi-purpose catering equipment.

c) A straight shift system alleviating the perennial problem of the traditional shift system and staff retention.

Reduction in production staff (chefs) is more apparent where the hotel has implemented the cook-chill system fully within their operation. It is the food and beverage manager's primary concern to achieve both profitability and acceptable food quality; cook-chill is being used to attain these objectives.

Figure 5.19

Function Menu Hotels

Consommé Julienné

* * *

Fresh Salmon Roulade

* * *

Poached Pheasant Breast Noilly Prat

served with

green beans and cherry tomatoes

croquette potatoes

* * *

Lime and Lemon Soufflé

* * *

Coffee and Mint Straws

A typical function menu for a four/five star hotel has been used for 1,000 quests based on data analysis from the survey, stages in both traditional and cook-chill production have been identified and staff requirements estimated.

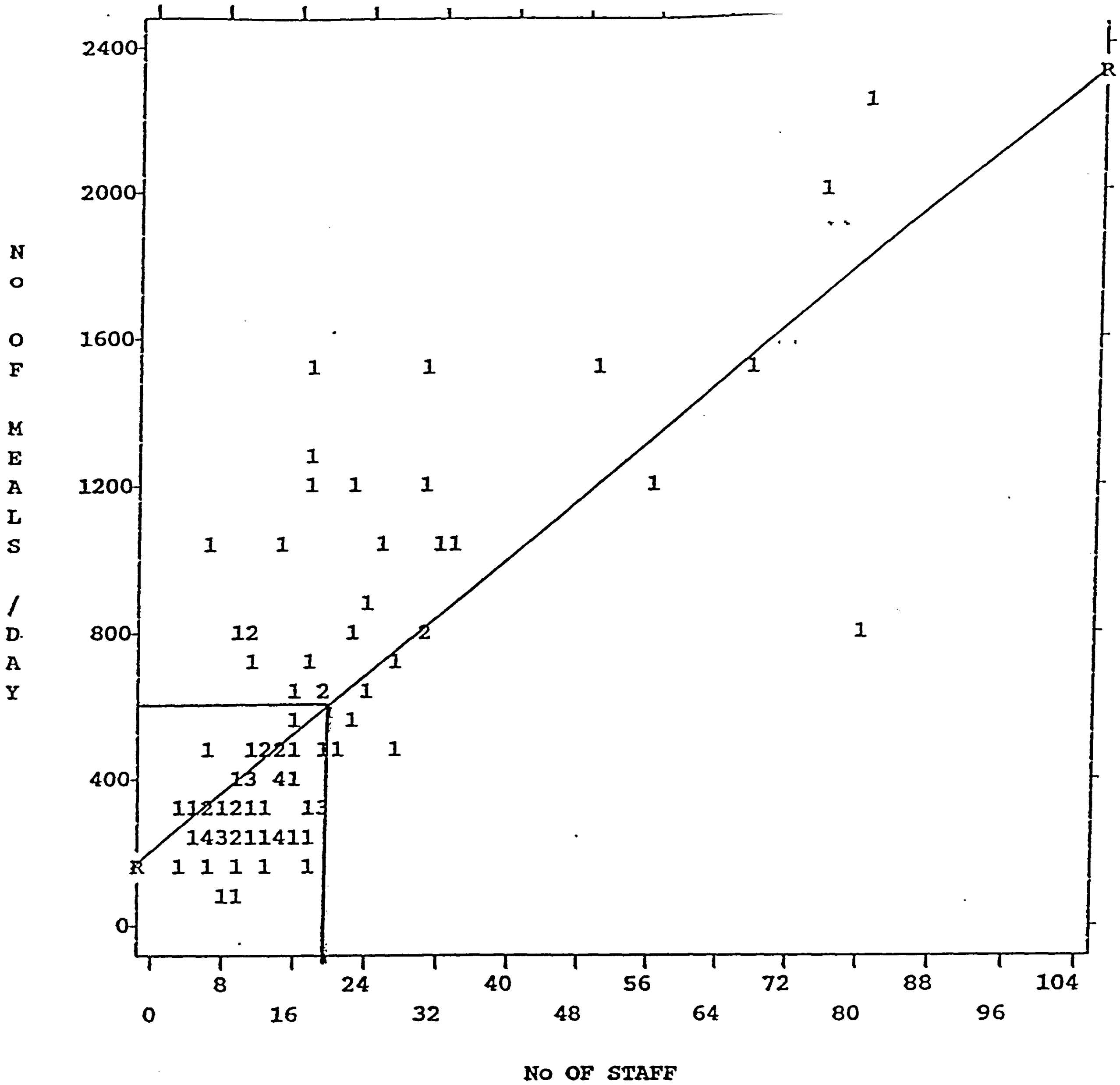
Figure 5.20 PRODUCTION SCHEDULE FUNCTION MENU HOTELS

	TRADITIONAL	SOME COOK-CHILL
STAFF	24 TOTAL X 1,000 MEALS	14 TOTAL X 1,000 MEALS
	PARTIE SYSTEM	
8 am	Consommé and Salmon Prepared 6 Staff Garnishes & sauces prepared 2 Staff	Same menu prepared 3 Staff Banquet Dishes
9 am	Roulade completed 3 Staff Potatoes cooked & shaped 4 Staff	5 Staff Prepared and Cook-Chilled
10 am	Pheasant prepared 5 Staff Lime & lemon soufflé 4 Staff	3 Staff 3 Staff for following
11 am	Pheasant poached Sauces completed Consommé clarified Julienne blanched	days function
12 noon	All menu items cooked	
12.30	Hot cupboard 68°C	Today's menu items regenerated in combi oven or regithermic trolleys
1 pm	Silver Service	Silver Service
Equipment Used	Gas Hobbs Hobart Mixer Knife Skills Pressureless Steamers Combi Ovens Bratt Pans Deep Fat Fryers Bain/Marie Hot Cupboards	Gas/Induction Hobs Hobart Mixer Knife Skills Pressureless Steamers Combi Ovens Bratt Pans Deep Fat Fryers Bain/Marie Hot Cupboards

Approximate number of chefs required for production of 1,000 meals. (see Graph 15 and 16) is traditional 24, cook-chill 14.

Hotels Only

This information shows on average that 20 hotel chefs produce approximately 548 traditional meals (see Graph 5.26 and Figure 5.5) meals per day per chef (m/d/c) with no cook-chill, compared with 765 meals (see Graph 5.27 and Figure 5.5.) with chefs using some or all cook-chill.



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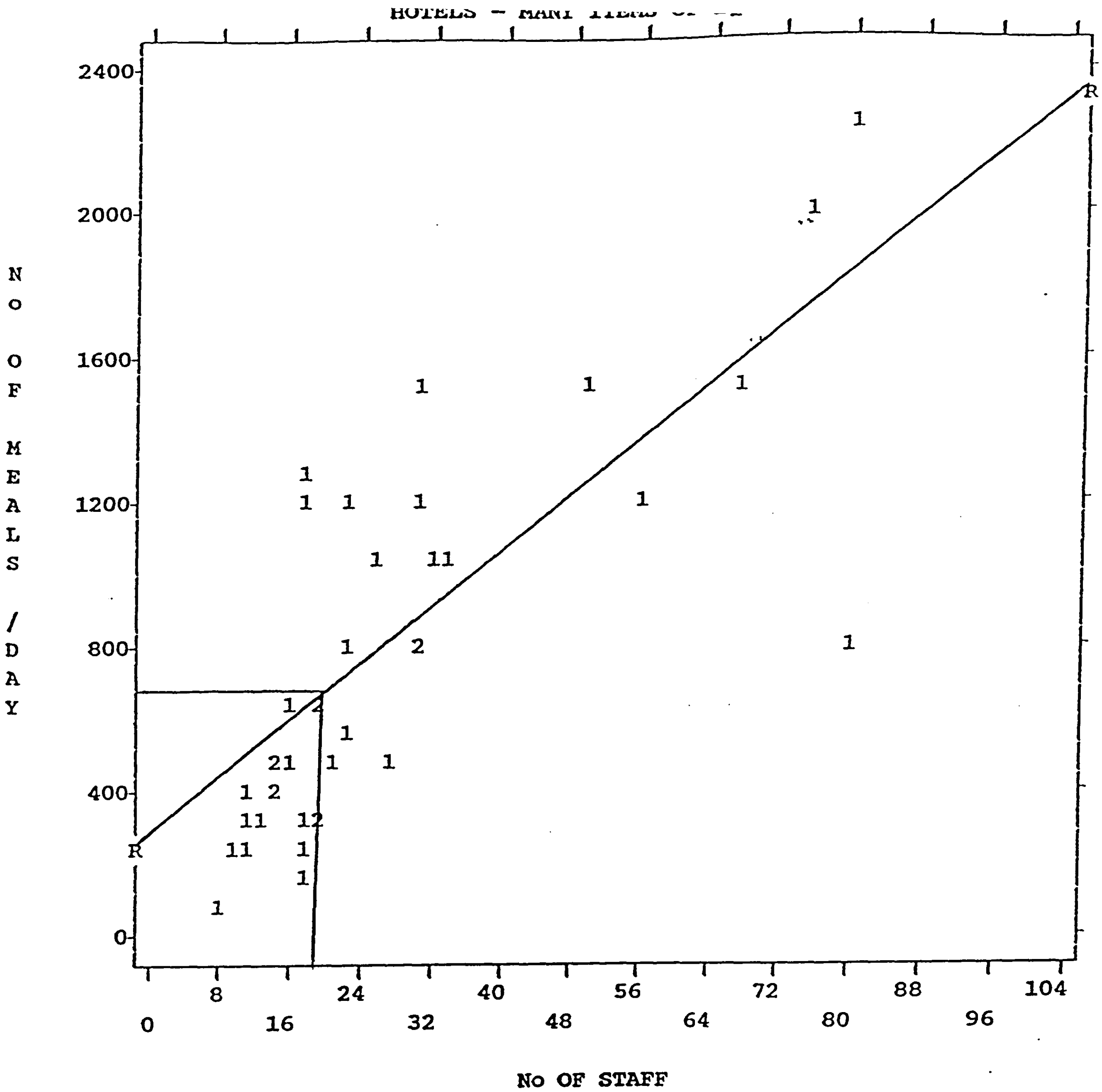
90 cases plotted. Regression statistics of Q2 on Q3:
Correlation .74136 R Squared .54962 S.E. of Est 290.53460 Sig. .0000
Intercept(S.E.) 183.11745(47.87823) Slope(S.E.) 20.72731(2.00014)

Hotels Only

This data shows on average that 20 hotel chefs produce approximately 597 meals per day.

Graph 5.21



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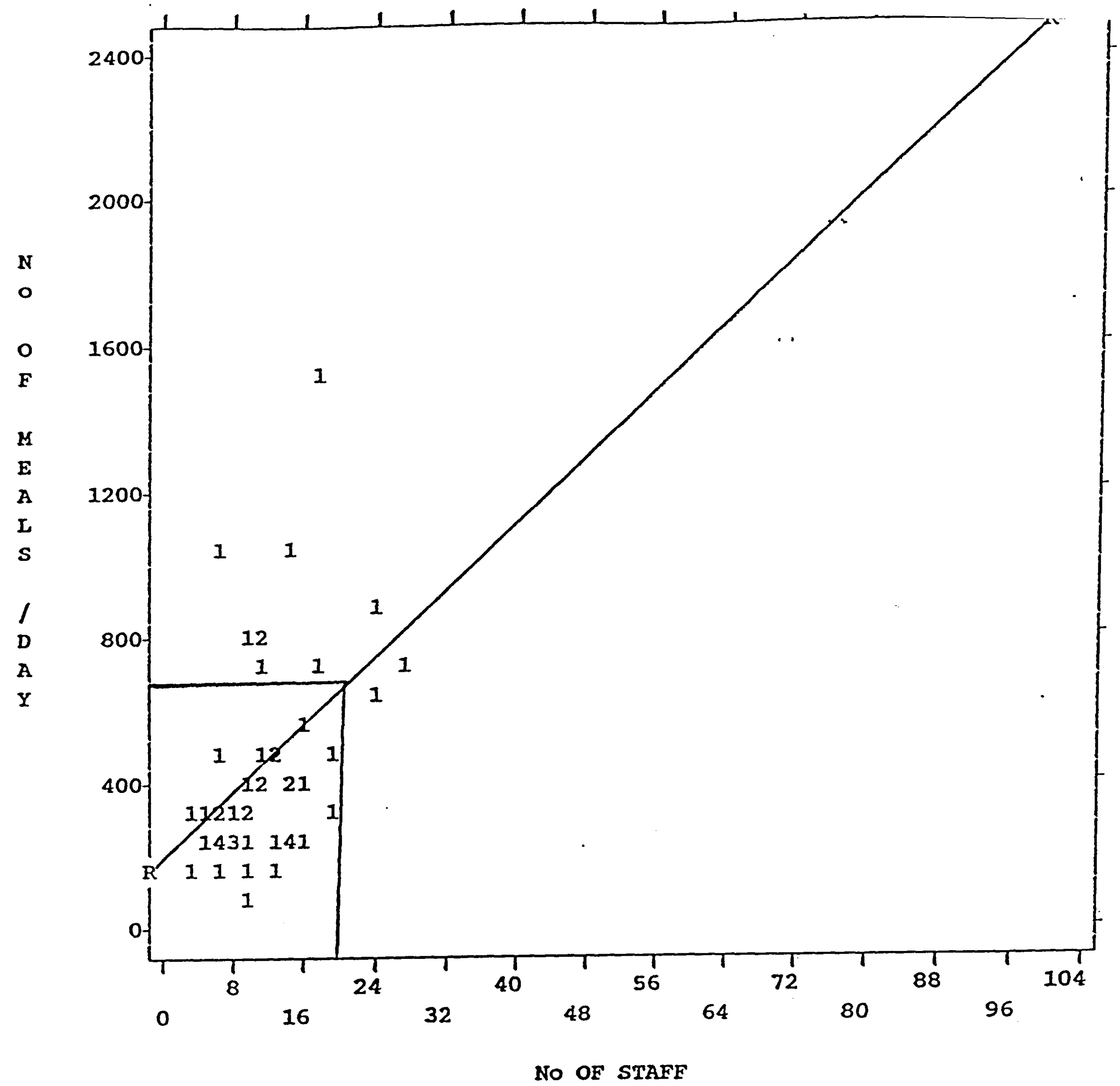
39 cases plotted. Regression statistics of Q2 on Q3:
Correlation .76551 R Squared .58601 S.E. of Est 334.27841 Sig. .0000
Intercept(S.E.) 205.10097(92.98909) Slope(S.E.) 20.20816(2.79236)

Hotels - Many items of equipment

Little significant information has been extracted other than that traditional hotels use more equipment if more meals are produced. Although the type of equipment and cooking methods used is largely determined by the customer's choice of menu, (e.g. chargrilled steak or poached turbot).

Graph 5.22



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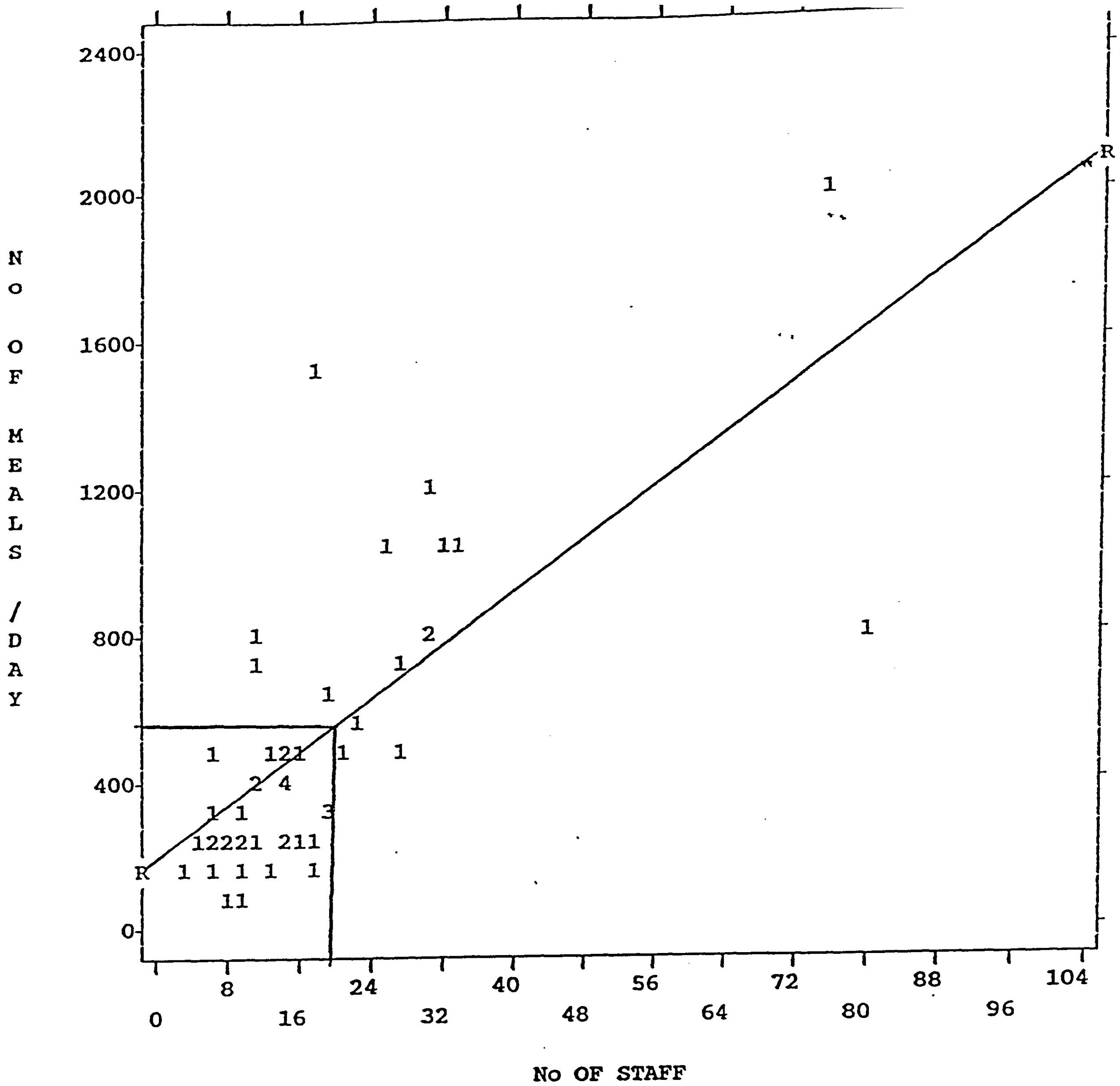
51 cases plotted. Regression statistics of Q2 on Q3:
Correlation .42376 R Squared .17957 S.E. of Est 258.74362 Sig. .0019
Intercept(S.E.) 154.92110(88.27280) Slope(S.E.) 22.63304(6.91115)

Hotels with less than 35 items of equipment

In function catering or conventional systems the main use of multi-purpose equipment (e.g. combi-ovens) would be for cooking and/or regeneration of the cook-chilled items, because of the oven's efficient re-heating and temperature control mechanism. No significant difference in productivity was found that depended on the number of items of equipment used. The productivity appears to be independent of the equipment used.

Graph 5.23



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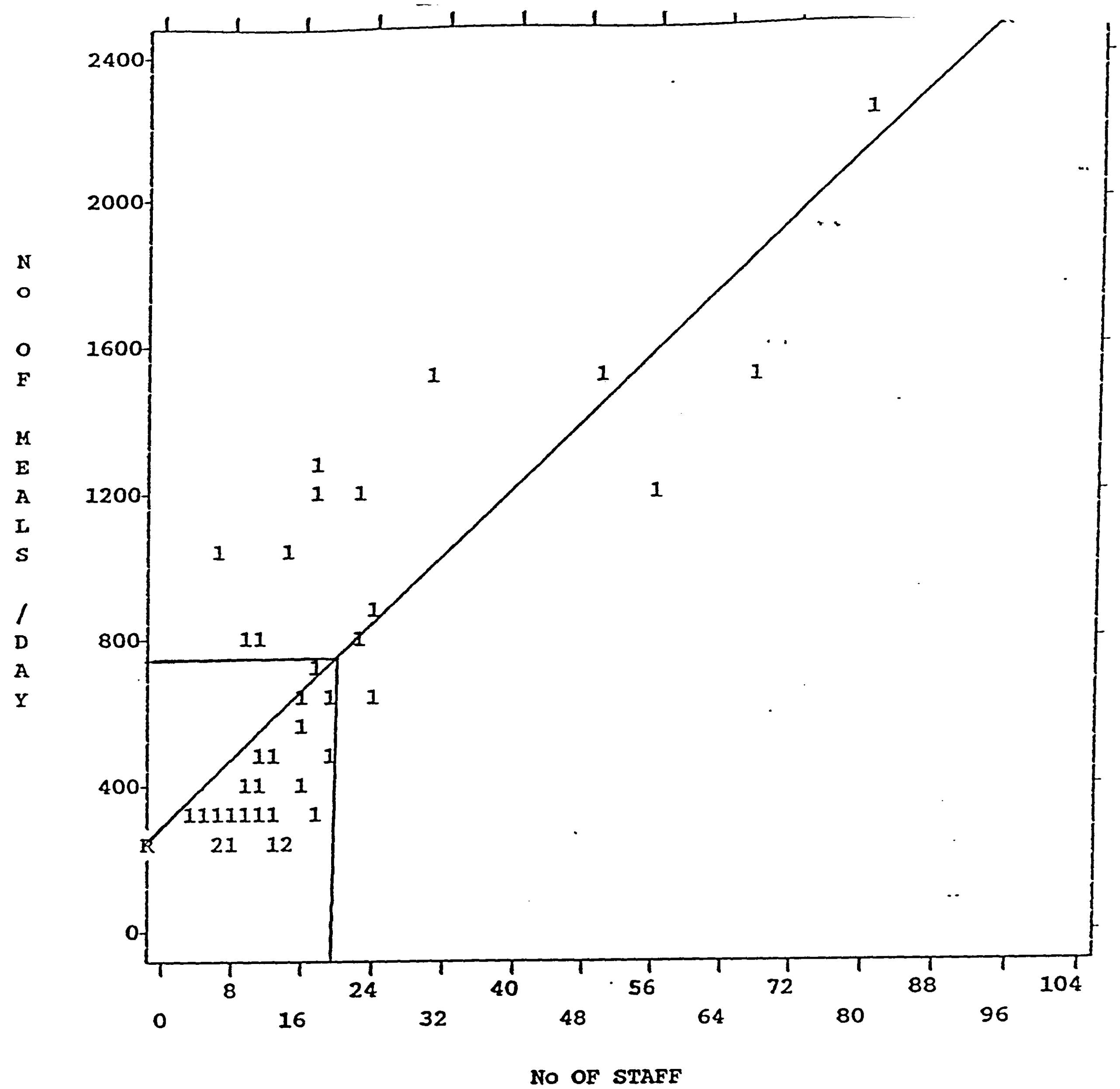
51 cases plotted. Regression statistics of Q2 on Q3:
Correlation .70217 R Squared .49304 S.E. of Est 271.47051 Sig. .0000
Intercept(S.E.) 150.54599(60.94672) Slope(S.E.) 18.35028(2.65820)

Hotels - Little prepared vegetables

The data that has emerged from the survey shows that traditional hotel production generally uses fresh vegetables in preference to pre-prepared as vegetables are used as a specific menu choice. (e.g. globe artichokes) and also for garnishes, e.g. julienne of vegetables which needs to be produced by hand (knife skills) as no modern equipment can adequately produce the vegetables for traditional garnish.
20 chefs produce 519 meals per day on average.

Graph 5.24



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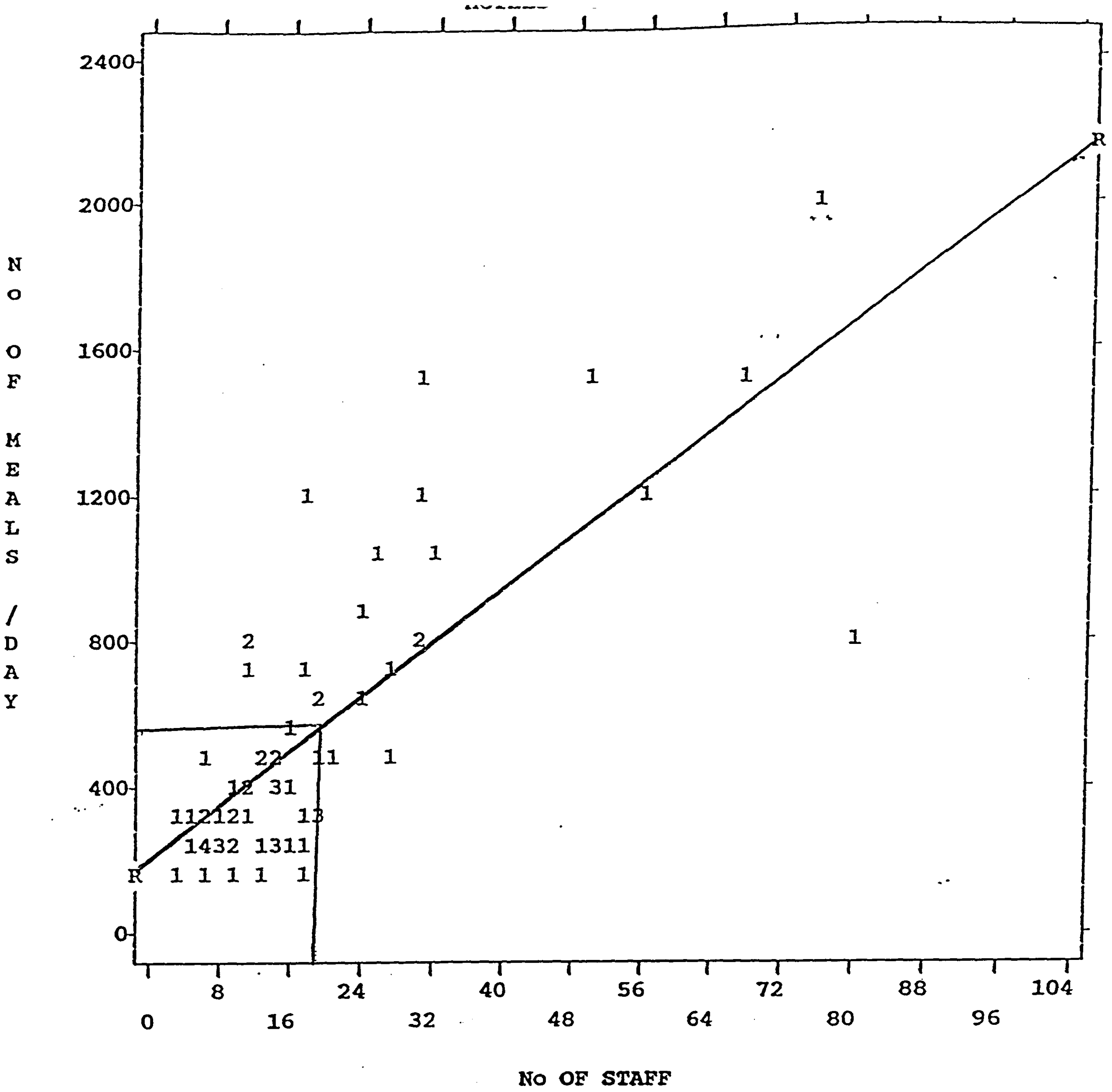
39 cases plotted. Regression statistics of Q2 on Q3:
Correlation .80096 R Squared .64154 S.E. of Est 287.26568 Sig. .0000
Intercept(S.E.) 244.66710(70.16092) Slope(S.E.) 22.65901(2.78453)

Hotels - Much pre-prepared vegetables

Where pre-prepared vegetables are used these may be mixed with other vegetables (e.g. petits pois à la francaise) with traditional or cook-chill production systems. The higher use of pre-prepared vegetables gives an increase in productivity to 698 meals per day per 20 chefs (a 30% increase)

Graph 5.25



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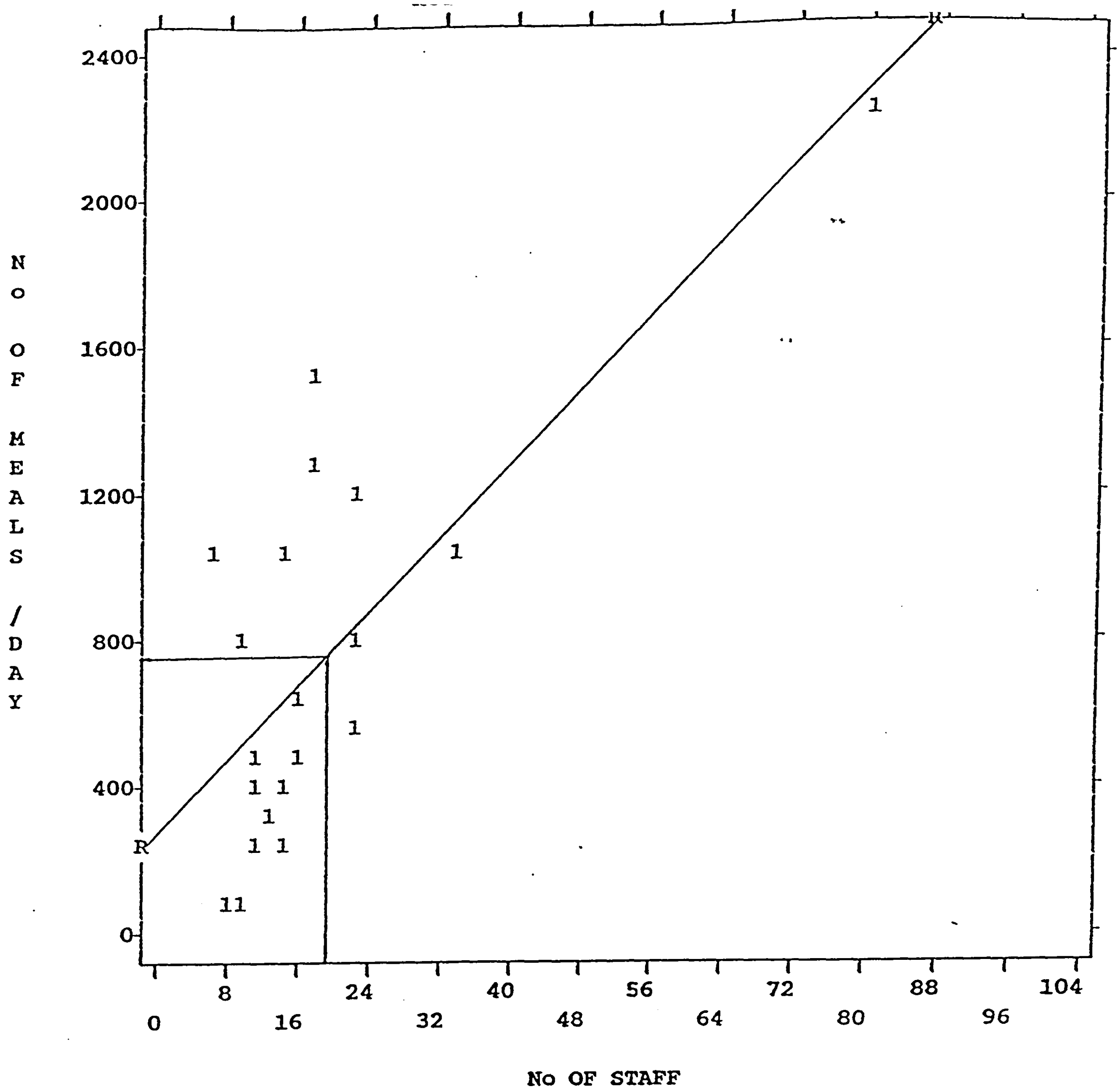
70 cases plotted. Regression statistics of Q2 on Q3:
Correlation .77391 R Squared .59894 S.E. of Est 247.96309 Sig. .0000
Intercept(S.E.) 158.20441(46.29817) Slope(S.E.) 19.54104(1.93912)

Hotel - No cook-chill

20 hotel chefs produce on average 548 meals/day with no cook-chill. If some cook chill was implemented for function catering this would increase their productivity without affecting the quality of the item to 765 meals per day,
Graph 5.27

Graph 5.26



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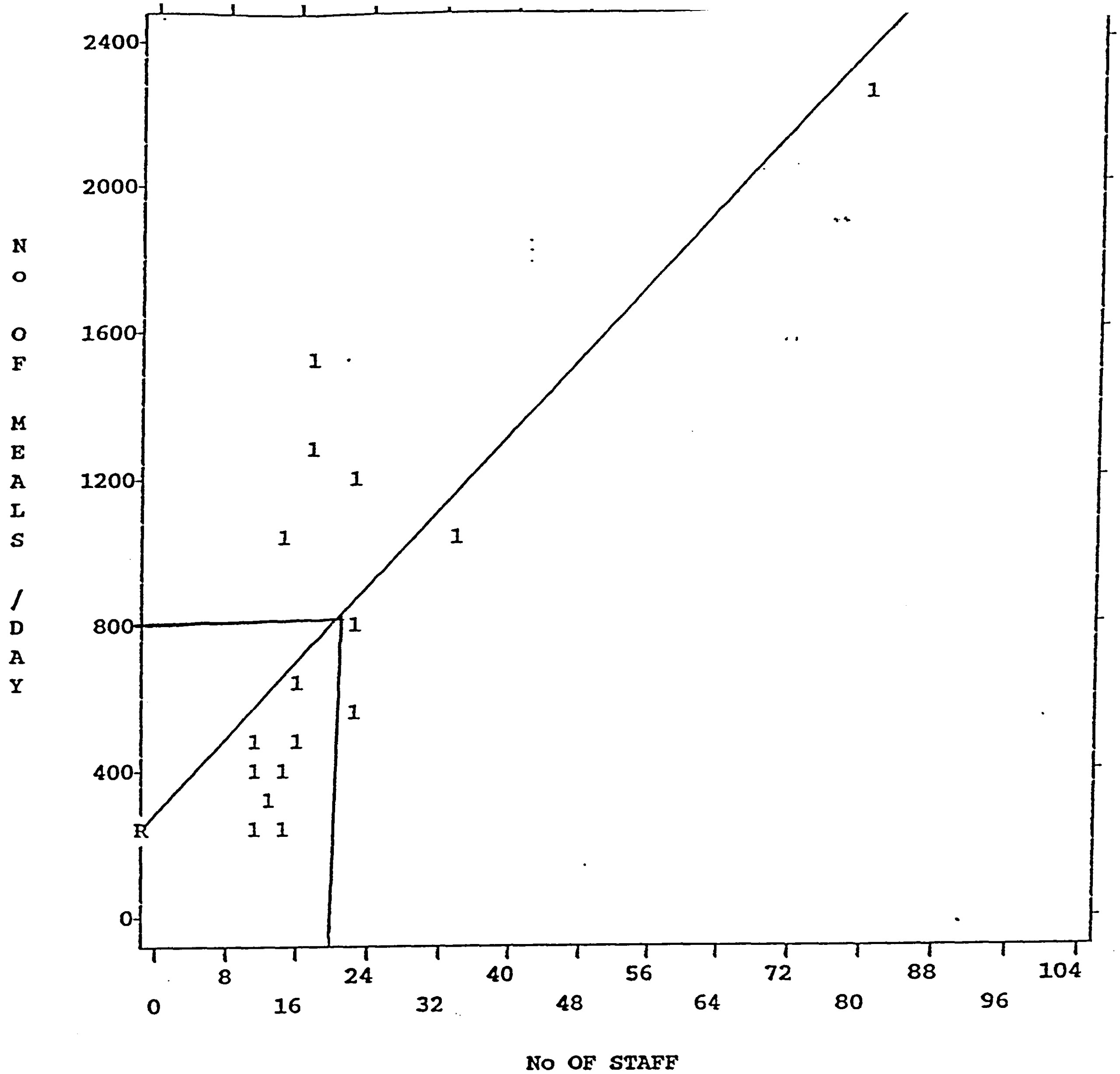
20 cases plotted. Regression statistics of Q2 on Q3:
Correlation .73409 R Squared .53889 S.E. of Est 370.08587 Sig. .0002
Intercept(S.E.) 273.75537(129.73227) Slope(S.E.) 24.63681(5.37158)

Hotels - Some or all cook-chill

From the survey on hotels the above information shows that on average 765 m/d/c can be produced by 20 chefs with some or all menu items being produced with some cook-chill. This increase is 32% more than traditional production there is an important issue here that the total number of chefs employed could be reduced, if all production could be maintained by a cook-chill production system.

Graph 5.27



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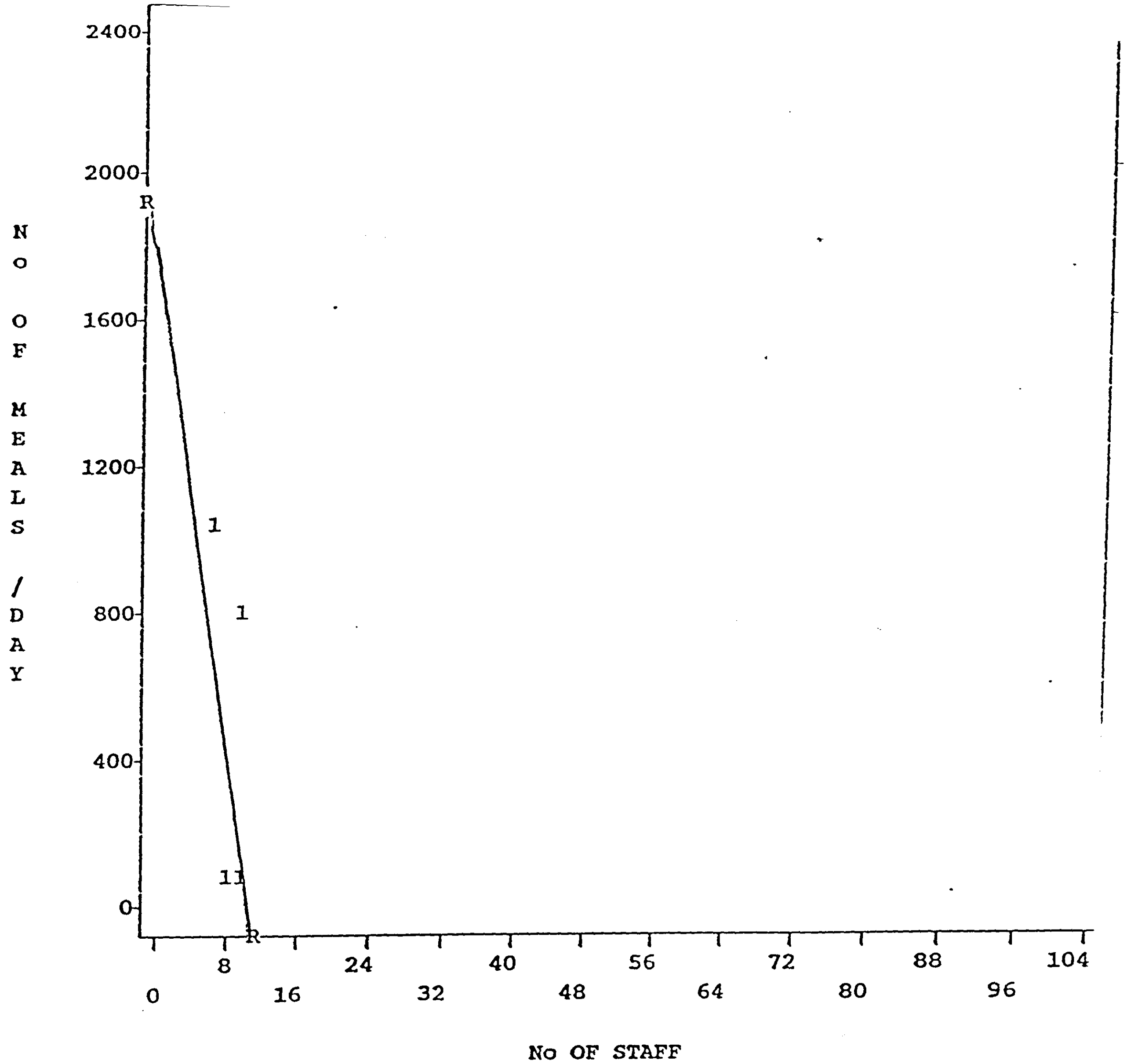
16 cases plotted. Regression statistics of Q2 on Q3:
Correlation .78122 R Squared .61030 S.E. of Est 350.65967 Sig. .0004
Intercept(S.E.) 253.35966(144.29182) Slope(S.E.) 25.32816(5.40923)

<u>Hotels - Some cook-chill</u>

This information Graph 5.28 and cook-chill Graph 5.29 were placed together to give a more accurate information as cook-chill on its own was too small a group and the "sig" value void. Both graphs together form some or all cook-chill Graph 5.27.

Graph 5.28



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4 cases plotted. Regression statistics of Q2 on Q3:
Correlation -.62419 R Squared .38961 S.E. of Est 448.80794 Sig. .3758
Intercept(S.E.) 1914.28571(1271.6854) Slope(S.E.) -171.42857(151.72478)

__Hotels - Cook-Chill__

Significant values do not allow the data to be used independently. However it is interesting to note that both these units are producing very high numbers of meals with low numbers of chefs.

Graph 5.29

5.11 Summary

From the previous data an overall conclusion can be drawn out summarised in the following sections.

a) Hospitals

Within hospitals menu choice is not so diverse as hotels, although the product has to achieve a consistent and acceptable standard, obtainable within a tight financial budget. From the data, hospitals employ 2-25 chefs producing from 400 to 10,000 meals daily. This is a vast increase on figures presented by Boltman (1975) (referred to by Glew and Armstrong, 1981) who proposed the use of technology to improve productivity, she presented figures depicting conventional production as 25-60 m/d/c and cook-freeze production 100-140 m/d/c. Within this sector, productivity can be increased and maintained if cook-chill and prepared vegetables are used. This confirms Snyder (1983) and Brendel et al (1985) who stressed the importance of cook/rapid chill production systems to increase productivity. (However they did not produce quantitative figures to substantiate this assertion).

Another aspect with using this production system is that a consistent high standard and quality control can be maintained by the chefs to enhance the patients perception of hospital meals. Possibly as Glew and Armstrong, (1981) proposed, catering managers need to assess to what degree technological change is strategically best for their operation. It may not be necessary for a complete change of production system but incorporation of more specialised equipment and pre-prepared vegetables can be used to reduce labour time and resourcing. This would not however deliver the very substantial quality and reduced human resource associated with the complete decoupling of production from service which full cook-chill delivers.

As Jones (1990) states, catering companies who have changed their "operational strategy and/or process technology" have achieved a competitive edge compared with traditional hotel and catering operations. This statement has been definitely and positively confirmed by the data. An increase in productivity is possible with better use of catering technology.

b) <u>Hotels</u>

The number of chefs employed (from 6-76) varies with the type and size of hotels, for example a five star hotel employs 76 chefs to produce approximately 2,000 meals. On the other hand a minimum number of chefs (six)) are employed in hotels using a full cook-chill system producing approximately 1,000 meals. This would dispute Brown and Hoover's (1990) argument (Section 3) who state there is no quantitative basis for determining the time required to produce a meal by a trained employee. This research provides overall productivity data for chefs producing food for a typical hotel. However, it is certainly a factor that trained staff are more productive than untrained staff as stressed by Kotschevar, (1968). The data figures do not attempt to differentiate on this basis.

However the argument is strengthened that trained staff can be more productive as the data shows that four/five star hotels using partial cook-chill are producing more meals. Observation of the staff involved in these units confirmed they were well trained.

This research also suggests that Mill (1989) is possibly wrong in his comments when he suggests "that little substitution of technology for people can occur without losing the whole meaning of the terms hospitality and service". In the four/five star hotels incorporating this technology the clear judgement is that service is improved and hospitality is made more possible through there being less stress in the system.

Within hotels the chef is seen as an artist who produces food with flair and intricate design. This skill is time consuming, but essential if the customers expectations are to be met and the intangible elements of service also provided. However, this emphasis on artistry does not mean that there is no place for modern technology. Cook-chill can be incorporated into this traditional system and is functioning very effectively in four/five star hotels producing menu items for á la carte and banquet functions.

5.12 The Typography of Productivity

From the literature review Catering Technology, Section 3.

Technological Food System Models, Booth and Dudley, (1989) confirm that the major technological advances today in the catering industry are in the area of chilled meals. A number of authors Escueta et al, (1986) have classified food production systems into various categories. For example within hospital catering traditional production has been classified into four components systems, cook-chill has six components, for bulk production.

Jones and Huelin, (1990) have developed a ten stage model for hospitals and hotel catering operations from storage, transportation to dishwash depicts correct work flow and a reduction in the 'peaks' of production.

Within the data it has been possible to develop a typography of production systems from a cluster analysis that breaks down the various groups of production systems within hotels (six components) and hospital (three components) production operations to form an applied model (see Figures 5.30 and 5.31).

One can ask if the operations investigated fall naturally into groups or clusters of operations which are similar to each other but different from other operations in separate clusters. This can be done statistically by a process called cluster analysis.

The basic of this analysis is most easily seen in a made up example with just two variables. Consider a survey of weekly income and amount spent on wine: these could be plotted as a scatter plot and inspection may lead us to draw a boundary around two groups of respondents, those with a high income and high expenditure and those with a low income and a high expenditure. Others would have to be allocated to other groups - possibly one other group may be those with zero expenditure on wine. This procedure is arbitrary but an analogous procedure may be done by computation.

One procedure (known as agglomerative clustering) is to calculate the distance between every pair of points on the graph and to place the two nearest into a cluster. Subsequent steps follow the same procedure using the nearest point in any clusters as the point to be used in the calculation. This is repeated until all the points have been combined into a single cluster. Generally the last few stages are presented allowing the user to make a subjective judgement as to the number of clusters created. The two dimensional procedure can be easily visualised as being applied to three dimensions and a mathematical procedure is equally easily extended to four, five or more dimensions.

Each operation is characterised by the number of meals produced per day and the number of staff; these can be divided to give a single characteristic (a measure of productivity) which will be the number of meals per day per chef (m/d/c) this is used as a new variable. The other variables available to characterise the operation are the use made of pre-prepared vegetables and the number of items of equipment in use.

There is a problem that the use of cook-chill in the present survey was measured on a scale of 1 to 3 and the use of pre-prepared vegetables on a scale of 0 to 300. If these variables were used in the analysis the use of pre-prepared vegetables would have an unacceptably large effect on the results. Before analysis all variables were transformed to a scale of 0 to 1 and to have a normal distribution. A new variable was calculated by dividing the number of meals by the number of staff to give the number of meals produced by each member of staff (m/d/c). This, along with the use of cook-chill, use of pre-prepared vegetables and number of items of equipment in use, was subjected to cluster analysis. Results are presented which show the members of each cluster and the distances between clusters. Vertical lines drawn down the figures show division into two, three, four etc. clusters.

The composition of the clusters was very little affected by the number of items of equipment in use; the main factors, as expected, appeared to be the use of cook-chill and the use of pre-prepared vegetables. By inspection of the clustering process, three groups were identified for hospitals and six groups for hotels.

<u>Hospitals Typography</u> **(Please see Figure 5.30)**

Group A: a high use of pre-prepared vegetables, no cook-chill

Group B : a low use of pre-prepared vegetables, no cook-chill

Group C: a high use of pre-prepared vegetables, using cook-chill.

The average productivity in each group can be calculated and the number of meals produced by 20 chefs on average for each group was found to be:

Group A: 2743 meals (range 620-7000)

Group B: 2180 meals (range 960-3180)

Group C: 6458 meals (range 3340-11000)

Two hospitals using some cook-chill fell into Group B and seven into Group A: but the typography apart from these exceptions was clear. This objective division of the hospitals surveyed into groups confirms the previous analysis which identified the use of pre-prepared vegetables and the use of cook-chill as the two factors with the major effect on productivity with enormous gains in productivity obtained by using both techniques.

<u>Hotels Typography</u> **(Please see Figure 5.31)**

The cluster analysis for this sector was very diverse compared to the hospital sector. The average productivity in each group can be calculated and the number of meals produced by 20 chefs on average for each group was found to be:

Group A: traditional production, low productivity, low use of pre-prepared vegetables.

Group B: partial cook-chill, medium productivity, variable use of pre-prepared vegetables.

Group C: traditional production, medium productivity, variable use of pre-prepared vegetables.

Group D: partial cook-chill

Group E: traditional production

These two groups although diverse in their production systems achieved good productivity with a medium to high use of pre-prepared vegetables

Group F: very small hotels or large hotels using cook-chill only. Very low or high productivity on mass production of limited menus.

Group A (10 hotels) mean 360 m/d/20 chefs (range 180-860)

Group B (11 hotels) mean 600 m/d/20 chefs (range 280-840)

Group C (54 hotels) mean 600 m/d/20 chefs (range 200-860)

Group D (4 hotels) mean 1360 m/d/20 chefs (range 1100-1660)

Group E (6 hotels) mean 1360 m/d/20 chefs (range 1200-1500)

Group F
Anomalous - 5 hotels

The largest group (Group C) averaging 30 m/d/c covers most usage of pre-prepared vegetables (0-250%) - three sub groups within this main group were distinguished by the cluster analysis on the different usages of pre-prepared vegetables. As there was no difference between the productivity of these groups it must conclude that the use of pre-prepared vegetables is not a strong factor in determining productivity.

Comparing group B with this main group reveals another group of hotels of identical productivity which are distinguished by using partial cook-chill. Again the analysis fails to demonstrate that the use of partial cook-chill leads to increased productivity.

Group A is a small group of hotels of extremely low productivity using traditional production methods and very little pre-prepared vegetables. Groups D and E both have a high productivity and medium to high use of pre-prepared vegetables (68 m/d/c) but hotels in Group D use partial cook-chill, those in Group E use traditional methods. Again comparisons of these two groups fails to demonstrate an improvement in productivity by the use of cook-chill. It is clear from these results that in contrast to hospitals productivity resulting from the use of cook-chill or the use of pre-prepared vegetables can not be clearly quantitatively demonstrated possibly a limitation of the cluster analysis, although a 'straight' use of regression tables show clearly that there are productivity gains to be had.

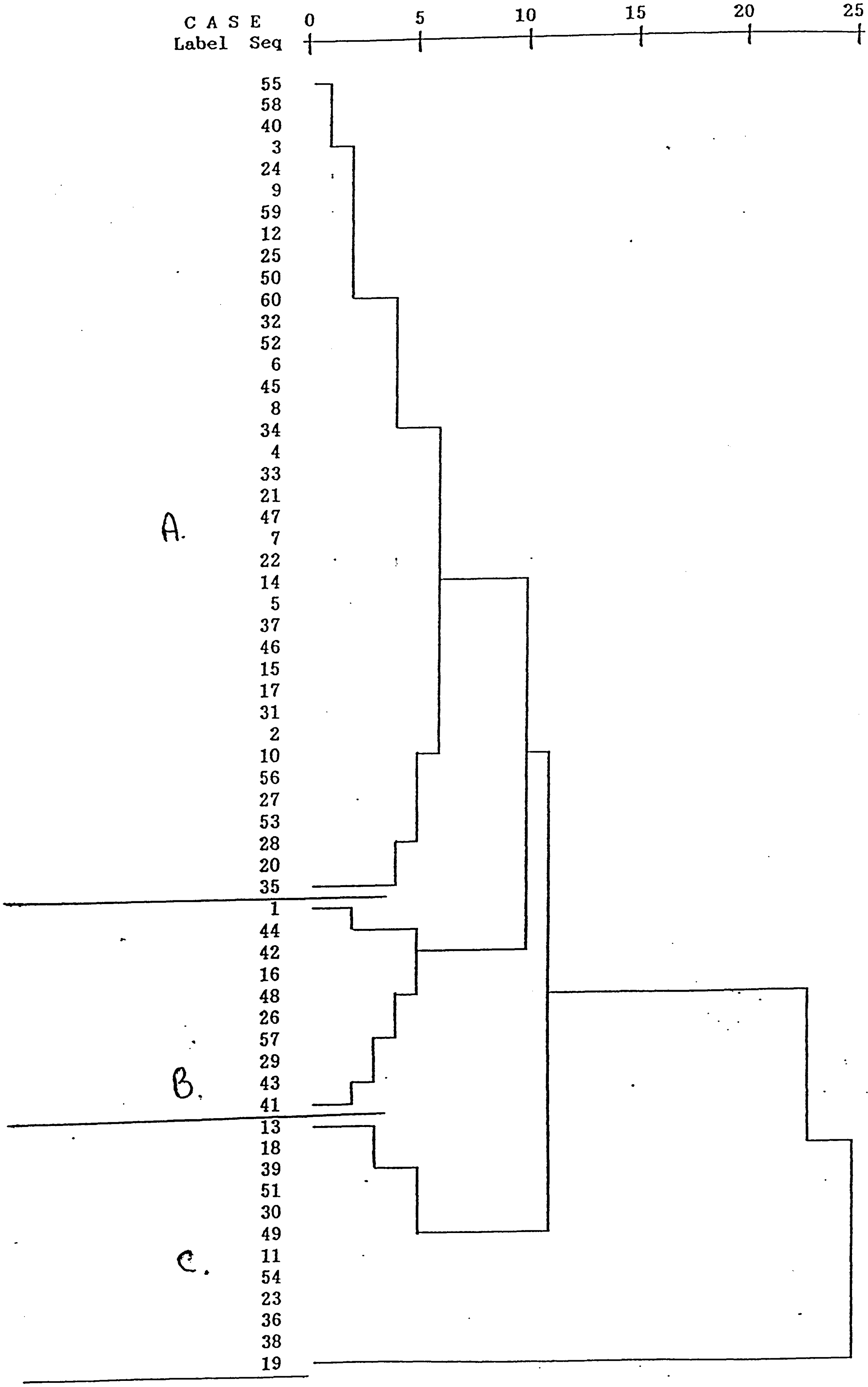
The implications is that factors other than these are the main factors driving productivity in this sector.

Examination of the production methods in the group of anomalous results gives some clues. The hotel with highest reported productivity works on a production line system (cook-chill) produce a very limited range of menus. This ensures that the meals were available when needed and to a high standard, and to different clientele, possibly coach parties of short stay tourists and large function catering to middle of the road business organisations. On the other hand the five star hotels have a wide complexity of dishes offered on the menu within their specialist restaurants and functions within the hotel. Also customer expectation would be greater with the clients capacity to pay more for the tangible and intangible elements of production and service. This would constitute a more labour intensive operation at the food service level, but catering technology can be incorporated into food production systems to increase productivity.

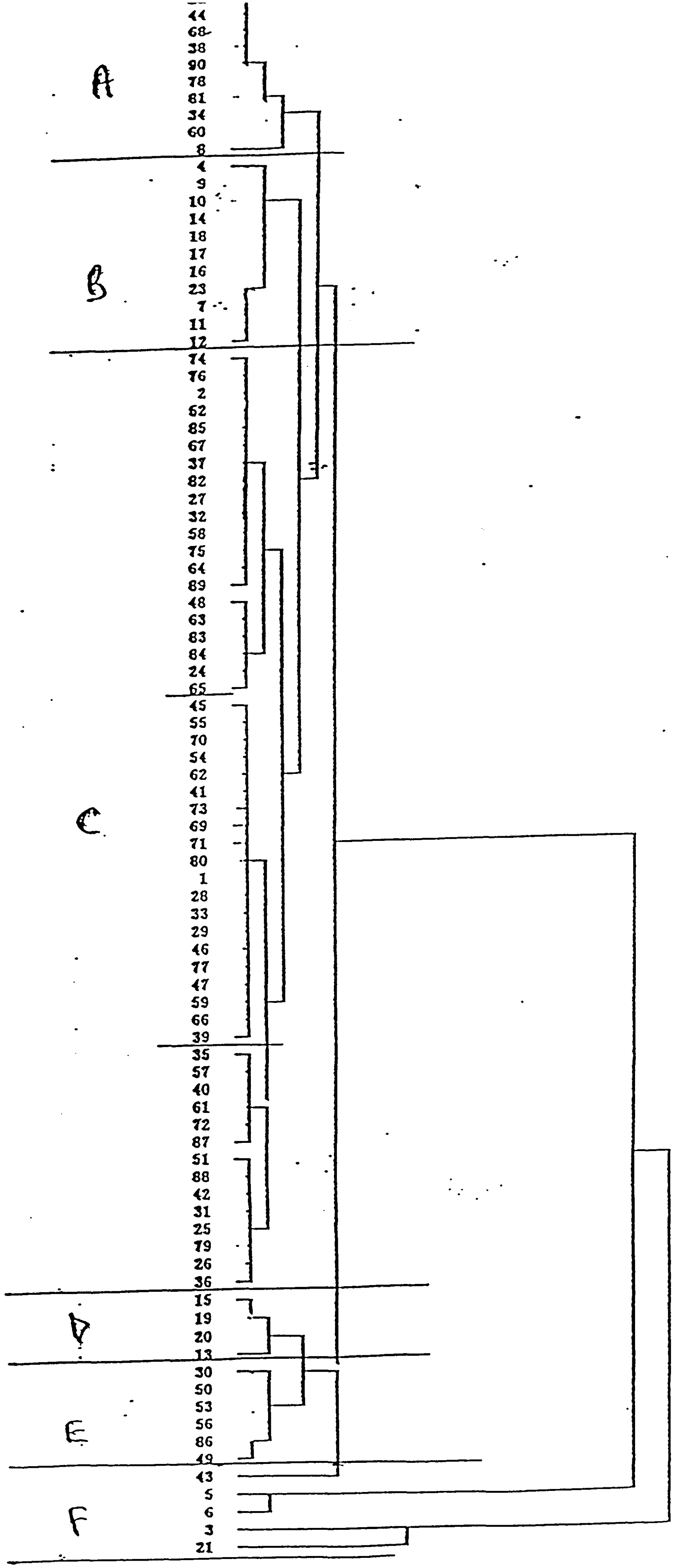
Contrasting with this, National Health hospitals constitute a homogenous group providing similar services to patients whose expectations do not differ significantly from one hospital to another. Differences in productivity can therefore be clearly seen and the causes of these differences analysed. This work has demonstrated the importance of pre-prepared vegetables and cook-chill in this sector.

In the hotel sector the differences between extremes are very wide and these differences hide the effects on productivity of cook-chill systems and the use of pre-prepared vegetables. This is not to say that these catering techniques are ineffective in this sector in increasing productivity - indeed the regression analysis shows that they are useful aids to productivity - it is just that cluster analysis is not capable of demonstrating this in such a heterogeneous group.

The results demonstrate the key role of both pre-prepared vegetables and cook-chill in achieving high productivity. Whilst cook-chill (an expensive system to install) has received wide attention in the literature, the use of pre-prepared vegetables (needing little or no capital investment to install) has received no significant attention. The increase in productivity from both these changes in productivity appear to be of comparable magnitude.



LUSTER ANALYSIS HOSPITALS



CLUSTER ANALYSIS HOTELS

5.13 Survey Conclusion

From the Hotels and Hospitals survey it has become apparent that the majority of hotel and catering operations are still labour intensive, there are historical reasons for this. However, catering management is being pressurised to reduce its labour costs. Various areas affecting productivity have been investigated. One aspect has been the use of catering equipment. It is clear from the questionnaire that certain pieces of equipment are agreed to be multi-purpose, easy to use and beneficial for productivity and the working environment. This strengthens the argument that catering equipment specialists tend to install a package of catering equipment rather than selected equipment tailored to a particular operation to achieve optimum productivity from catering technology.

The research has also high-lighted the use of pre-prepared vegetables; although used in many establishments they have been under-rated as an aid to productivity. Their use is economical for the caterer with less staff employed for vegetable preparation and less equipment to purchase and maintain. Although there will be an increase in purchase cost, this is unlikely to exceed the productivity gains achieved.

Cook-chill systems are seen from the research as a catering process to be viewed with optimism. Although constant monitoring and quality assessment are needed, this is an advantage to the caterer. Also better productivity and hence cost controls can be achieved especially within hospital catering. Within hotels cook-chill can enhance function catering with high technology greater flexibility and better production schedules.

It has also become apparent from the research that cook-chill must be implemented with effective staff training and communications. It is important that staff perceive and accept that high standards can be maintained or increased, without loss of skills. It is evident from the survey that the cook-chill production system can make a significant contribution towards increased productivity.

SECTION 6

CONCLUSION

6. CONCLUSION

6.1 Introduction

Management of productivity and catering technology is a complex and diverse process. From the main findings of the literature review, and the direct research carried out via case studies and questionnaires, some of the key conditions necessary to achieve high levels of productivity and to utilise catering technology effectively can be identified.

Productivity has been defined by various authors (often relating to the manufacturing industry) but the principles of measuring either numerically or by formulae can be applied to the service sector. Within this process, as found within the literature review, there are limitations when applied to the hotel and catering sector, as intangible aspects of the industry must be considered within the input and output of productivity. Another aspect that affects productivity within the industry is the many catering units which operate under extremely poor conditions. Inadequately thought out production systems lack work flow and generate high stress levels for the users; this aggravates staff turnover and absenteeism. This lack of good planning can be observed in many hospitals and hotel kitchens with their 'bolt on' technique of adding a cook-chill/ganymede system, or a single item of versatile equipment onto a traditional production operation. The quality of the end product is often adversely affected, along with productivity.

In some respects even within new central production units, good design is still lacking. I found evidence of poor practice such as open access to butchery areas, insufficient chilled storage for further expansion and manually-operated packaging systems that could cause cross contamination.

However examples of good practice were also found. As the research shows, substantial productivity gains can be obtained with the use of a "high technology" process, such as cook-chill. The research has clearly demonstrated that high productivity can be found within central production units employing few staff. Contrary to some views, this catering process does not entail the de-skilling of staff. Expertise is still required, in the same way as within a traditional system that employs more staff.

Introduction of more limited technology with the use of specialist equipment can also increase productivity with correct usage achieved by adequate staff training. From the data obtained, using either high or limited technology, productivity can be increased with the simple addition of using pre-prepared vegetables. This gain in productivity can benefit both hotels or hospital catering outlets.

One important issue that has emerged from the research, that affects all sectors of the catering industry, is the benefits of good communication and of involving chefs in the planned organisational change within production kitchens by using their expertise to ensure effective work flow and equipment lay-out. If this professional competence is lacking, then the organisation must be made aware and resolve this problem by investing in appropriate training for all staff concerned.

Research Methodology

As confirmed by certain authors within the literature review, the major difficulty has been the lack of typographies or examples of productivity associated with the hotel and catering industry. Signposts from other applied research were limited.

With the research methods used, the only area of difficulty experienced was found in some of the responses to the questionnaire. This necessitated clarification through direct contact. As already explained in the survey section this was mainly concerned with use rather than availability of equipment. However, the questionnaire did highlight the great diversity in achieved standards of catering productivity and the types of production systems and catering equipment used.

Overall the research methodology was valid, within the Literature Review a rich picture was formed of the hotel and catering service sector, the achievement of productivity and the application of technology. The case studies gave further aspects and depth of understanding concerning production systems and management styles. From this, the questionnaire investigated further key areas of productivity and catering technology. The data obtained will be beneficial to the industry, in producing productivity benchmarks against which further progress can be measured.

6.2 Defining Productivity

In any catering operation physical inputs include food, labour, energy, other overheads and capital covering the buildings and equipment. It is usual to measure these inputs financially, in terms of the costs incurred. Frequently it is useful to divide labour costs between the various grades such as ancillary, chefs/cooks, waiting staff and management. As caterers provide a service, for which customer satisfaction is probably the most important output, non-physical inputs such as ambience, interpersonal skills of staff and creativity of chefs should theoretically also be included in the calculation of the output. However as previously discussed these inputs are more difficult to quantify.

The major outputs in the hospital/hotel sector are meals and customer satisfaction. Evaluating the most comprehensive measurement of productivity would entail quantifying all of the inputs and all of the outputs in terms of a single unit (usually money) and dividing the total input by the total output. Although it may seem initially unreasonable to express customer satisfaction in terms of money, in the profit making sector it does have a real monetary value derived from the price customers are willing to pay for the service, their willingness to repeat the experience and their personal recommendations to other potential customers. Within the hospital sector customer satisfaction will affect the well-being of patients and hence probably the success of the medical care delivered. However, the difficulties involved in this approach to calculating productivity means that most catering operations use partial measures of productivity, (if any), concentrating on the more easily quantifiable parameters of the overall equation.

Labour efficiency (labour costs divided by income from food sales) is one such partial productivity ratio. Typically the labour cost of meal provision is Fast Food 11-18%, Restaurants 25-35% (Kipps and Middleton 1990); Hospitals 60% (Brown and Hoover 1990). These figures vary somewhat according to different accounting conventions but the cost of staff is almost always the most substantial part of hospital/hotel meal cost.

It is therefore clear that any consideration of productivity in the hospital/hotel sector must include the productivity of staff, as this is the largest single cost element. As already proposed staff can be considered in four groups: chefs/cooks, ancillary kitchen staff, food service staff and administrative staff. This research deals with the first category chefs/cooks only.

As outlined in the preceding literature review, various approaches have been used to measure productivity ratios. From the accountants' point of view, monetary units are preferred, the value of the output being divided by the cost of the inputs. However one disadvantage of this is that the price of labour can substantially affect the equation. This would favour catering operations in areas where labour was relatively inexpensive and give a misleading view of the inherent productivity

In the United States (Olsen and Meyer 1987) and in Sweden (Skroder 1981), productivity has been studied in terms of the <u>time</u> taken to complete tasks (for example to prepare a menu item or to prepare a meal). This involves time and motion study in the kitchen with all the problems associated with the effects of being observed affecting the system that is being observed. Whilst these studies are of some theoretical importance, they do not measure productivity meaningfully, as no account is taken of time spent waiting for work during quiet periods, training (for new staff) receiving instructions for the day's work, or other necessary but apparently unproductive activities.

The results of this type of work are reported in various measurement units and there has been some discussion in the literature review of which units are most appropriate, for example Freshwater and Bragg (1975) and Brown and Hoover (1990). All measures of physical output per person are theoretically equivalent as they are inter-convertible in principle. Minutes per menu item can be converted to minutes per meal if the number of menu items that constitute a meal is known. Minutes per meal can be converted to meals per hour per chef by simple multiplication. Even cost of the work input to a meal could be converted if the hourly wage of the worker were known. Lastly meals per hour per chef can be converted to meals per day per chef if the average hours per day worked is known and all time including 'unproductive time' has been measured.

In addition, it would be useful to be able to ascribe the amount of labour needed to produce each type of meal. In theory, work study techniques could be used to estimate the proportion of time spent by chefs on breakfast, lunches, dinners and, if appropriate, other types of meals such as snacks, receptions etc, and to use these figures to allocate a staff cost to each type of meal. Perhaps the key point in determining which measure to adopt should be that which is most meaningful within the service sector being considered.

In this research I have chosen to determine productivity in terms of meals per day per chef (m/d/c) as this is the most easily converted to any other units (including cost) as the conversion factors appropriate to the operation of interest to the caterer will be known. The unit chosen (m/d/c) also seemed most meaningful to managers within the sector. Since this measure involved calculating the total number of meals produced by a hospital/hotel kitchen and dividing this output by the number of chefs/cooks employed (the input), this method of measuring takes into account all the activities (including unproductive activities) that go on in a kitchen and gives a figure that reflects the true cost to the hospital/hotel of producing meals. This approach has the advantage of being universally applicable; if one were to choose to work in monetary units the figures would be frozen in time to the particular hourly rates applicable to the unit or organisation studied at the time of the survey, making inter-conversion difficult.

6.3 Productivity Performance

As a means of increasing productivity this research has clearly demonstrated (Section 5) that productivity can be increased substantially by using catering technology, especially with cook-chill or partial cook-chill and modern specialist equipment within production kitchens.

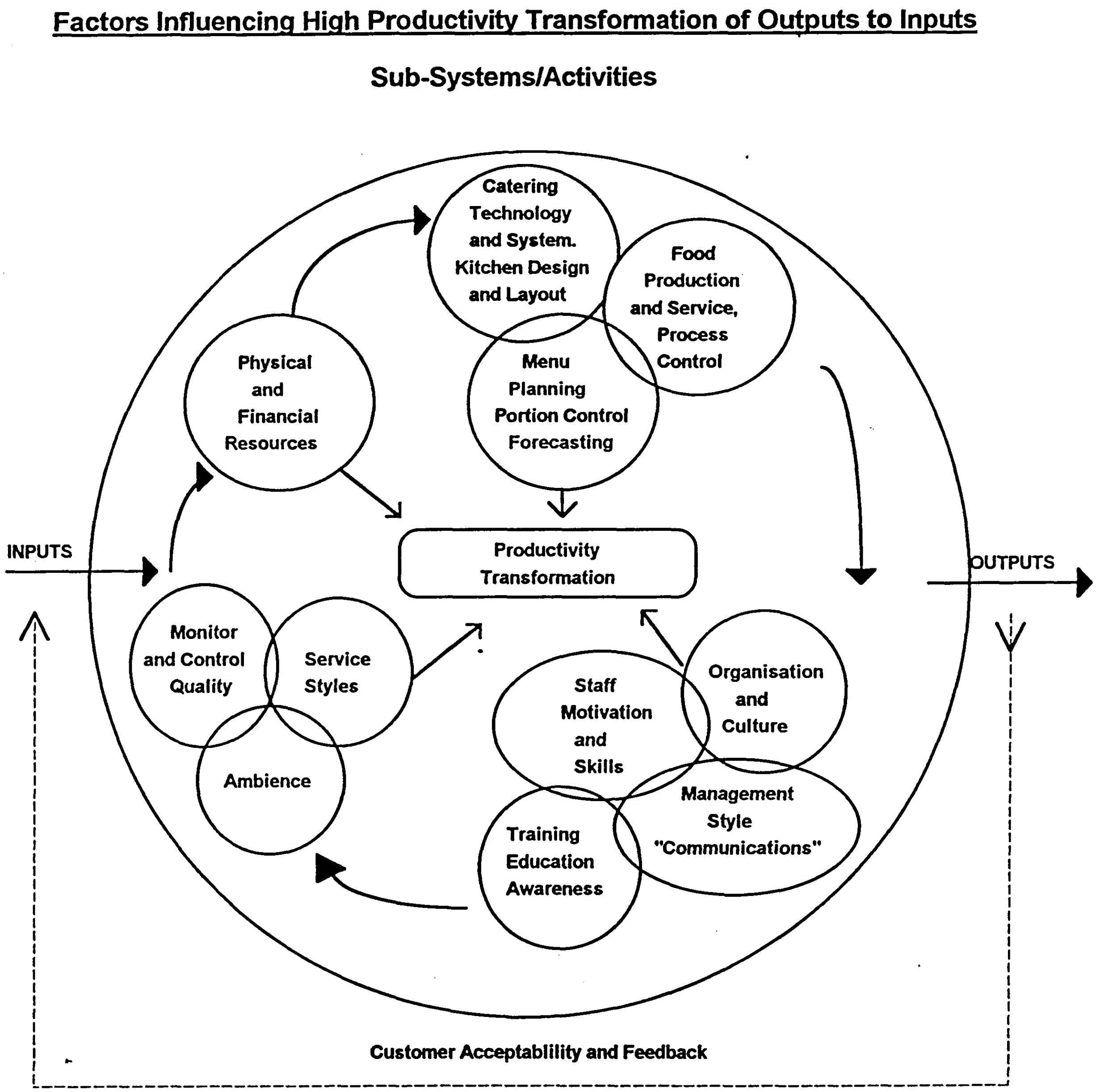
One of the many advantages associated with cook-chill is that any inaccuracies in forecasting do not necessarily lead to either overproduction and waste or under production and output opportunity being lost. This is due to the flexibility of the "buffer stock", (unlike traditional production systems where over production leads to high wastage). Cook-chill systems also emphasise portion control as the number of meals stored needs to be carefully calculated. The cook-chill system also encourages management to allocate staff more accurately for production and service as found within Case Studies 2,4,5 and 6. This confirms Pickworth (1988) who states that over-production/over-staffing within traditional catering causes poor productivity as labour costs are highly perishable.

This research also supports theories stated by Synder (1983) Brendel et al (1985) who stressed the importance of cook/rapid-chill production systems to increase productivity, (although they had no quantitative figures to substantiate their assertions).

It is clear from the research that catering technology can benefit food production productivity (for example within hospital catering, banquets and conference functions within hotels) without adversely affecting standards or consumer expectations (although quality was not explicitly measured). In many cases (based on personal observation of the case study outlets), I believe that catering technology, used effectively, improves quality and acceptability. This research also substantiates Jones (1990) who states that catering companies who have changed their operational strategy/process technology, achieve a competitive edge.

However these systems do have to be implemented and controlled carefully in order to achieve high productivity performances. The key factors in implementation and control are emphasised by the following (Figure 6.3.1) productivity model, which illustrates the multi-faceted approach which is required if productivity potential is to be achieved.

Figure 6.3.1 Multi-faceted productivity model



Ensuring high productivity within hospital and hotel catering has to include both 'hard' technological components and softer human resource based components. A mult-faceted approach is required to actualise inherent productivity potential.

Productivity in its broadest sense must mean effective use of resources-people, machines, money, raw materials: these are needed to allow an organisation to grow and operate productively. But within this framework the food production process has to be assessed in all its forms to achieve the optimum productivity conditions. Some food production operations divide functions into many basic operational sub-systems, for example storage, pre-preparation, food preparation, cooking/processing, food assembly/presentation, transportation, service. These catering systems must be integrated into operation as a whole unit, not managed separately, as is often found in the traditional hotel and catering organisation.

The clusters encompassed within Figure 6.3.1 emphasise the areas of activity needed to develop productivity within the hotel and catering sector. As with all business organisations the physical and financial resources are paramount to obtain the best site and building for the operation to function, (and possibly expand) especially if a central production unit is being considered.

From the research data and Case Studies 2,4,5 and 6, it has been confirmed that a cook-chill/partial cook-chill production system, achieves high productivity increases. These systems are also beneficial to management by reducing the number of chefs/cooks during production and service times, unlike traditional production operations Case Studies 1 and 3 where large numbers of staff are employed. With the correct use of modern catering technology customer/patients alike receive high quality meals as the food is cooked, chilled and maintained at a required standard and heated on demand. In this respect the traditional organisation and culture of hospital and hotel catering is changing, although slowly, and affecting productivity.

Menu planning is one of the most important inputs; it is the key to the operational system being managed and reflects the type of function/meal that staff are striving to utilise their skills, training and achieve customer satisfaction for. An essential part of this is correct portion control. As found within Case Studies 2,4.5 and 6 correct forecasting and portion control is essential to prevent food waste and to control cost. From Case Studies 7 and 8 it is noticeable that menu design has been partly consumer driven with customers requiring simpler dishes. In turn management required a faster turn round of customers to obtain a better cash gross profit. However both 7 and 8 failed to function successfully because of poor kitchen design and staff unable to appreciate or use the catering technology correctly. This emphasises the point that all factors affecting productivity need to be interacting effectively and consistently. In Case Study 2,4,5 and 6 emphasis was given to the importance of training chefs/cooks in the efficient use of new technological equipment to aid productivity. Kitchen design and layout must also reflect the needs of the chef/cook, as well as the menu design. Wrong positioning of catering technology/equipment affects efficiency/work flow of the whole operation. Another important aspect of catering technology is the implementation of appropriate up-to-date equipment to aid productivity (for example pressureless steamers).

This research confirms that substantial increases in labour productivity are obtained with the use of pre-prepared vegetables. These offer better measurement and control and It would seem from the case studies, pre-prepared vegetables may be used in isolation as a convenience source. However they can be (and no doubt are) used by chefs/cooks alongside other types of convenience foods, (for example ready portioned meats and fish) to aid productivity. In Case Study 4 it was observed that oven chips and fish were used to prevent frying odour and excess heat permeating the atmosphere, but with the main purpose of preventing staff standing for hours frying foods, as many traditional production systems. Convenience foods are costly, but they increase labour productivity.

Another area of great concern is capital expenditure. Although great investment is placed on new technology there seems to be little or no means of comparing traditional costs with new technology costs. Especially within hospital catering where energy costs are absorbed by a central power generator. However it would seem obvious by using old traditional equipment excess heat loss occurs and if replaced by modern equipment these problems are removed. Therefore, catering technology should be specified, based on a production system plan which would also determine optimal labour requirements, plus acceptable levels of performance.

From the research, increases in productivity can also be influenced by management styles. This is mentioned within Case Studies 2 and 4 where good communication skills and adequate staff training are emphasised. Staff involvement confirms Staw (1986) and Sheard (1992) who both stressed that involving staff in planning and enabling staff to train, increases output and productivity. However staff need to be aware of the reasons for change and feel involved with the process of implementing new technology. It is necessary for them to be informed and trained as to how and why catering technology can increase productivity and enable them to enhance their skills by removing the tedium of basic tasks.

From the food service aspect as observed in all the case studies it is important for the food to be served/consumed at the correct temperature and be pleasing to the eye of the consumer. Whatever service style is being used the ambience of the restaurant or cafeteria is very important. It was very noticeable, especially within the hospital staff restaurants, that good lighting techniques on the display of foods heightened customer expectations. Customers/patients were also aware of the monitoring and controlling of the quality and temperature of all foods, to enhance their satisfaction. Productivity is without purpose if it is achieved at the expense of quality.

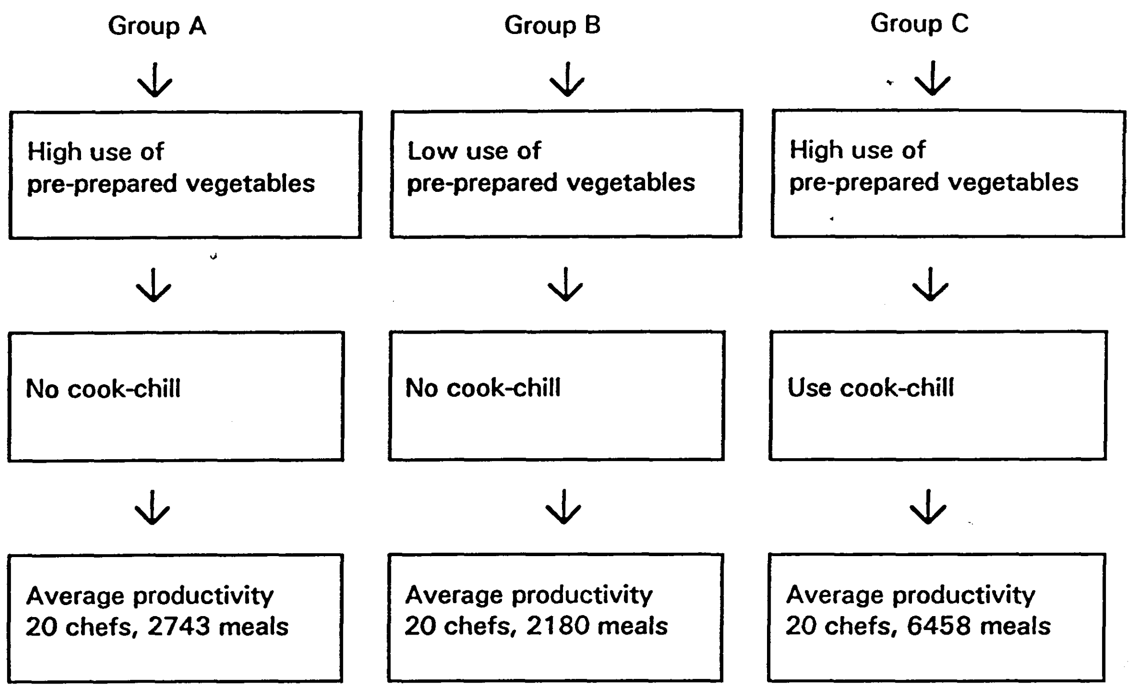
Increased productivity will only be achieved when all the above aspects are considered and managed concurrently.

6.4 The Typography of Productivity

Each operation is characterised by the number of meals produced per day and the number of staff; these can be divided to give a single characteristic (a measure of productivity) which will be the number of meals per day per chef (m/d/c). This is used as a new variable. The other variables available to characterise the operation are the use made of cook-chill, the use made of pre-prepared vegetables and the number of items of equipment used.

The composition of the models obtained from the cluster analysis shows that meal production is minimally affected by the number of items of equipment in use; the main factors appear to be the use of cook-chill and the use of pre-prepared vegetables. By inspection of the cluster analysis (Figures 5.30 and 5.31, Section 5) three models were identified for hospitals and five models for hotels, (although this section was extremely diverse in its output).

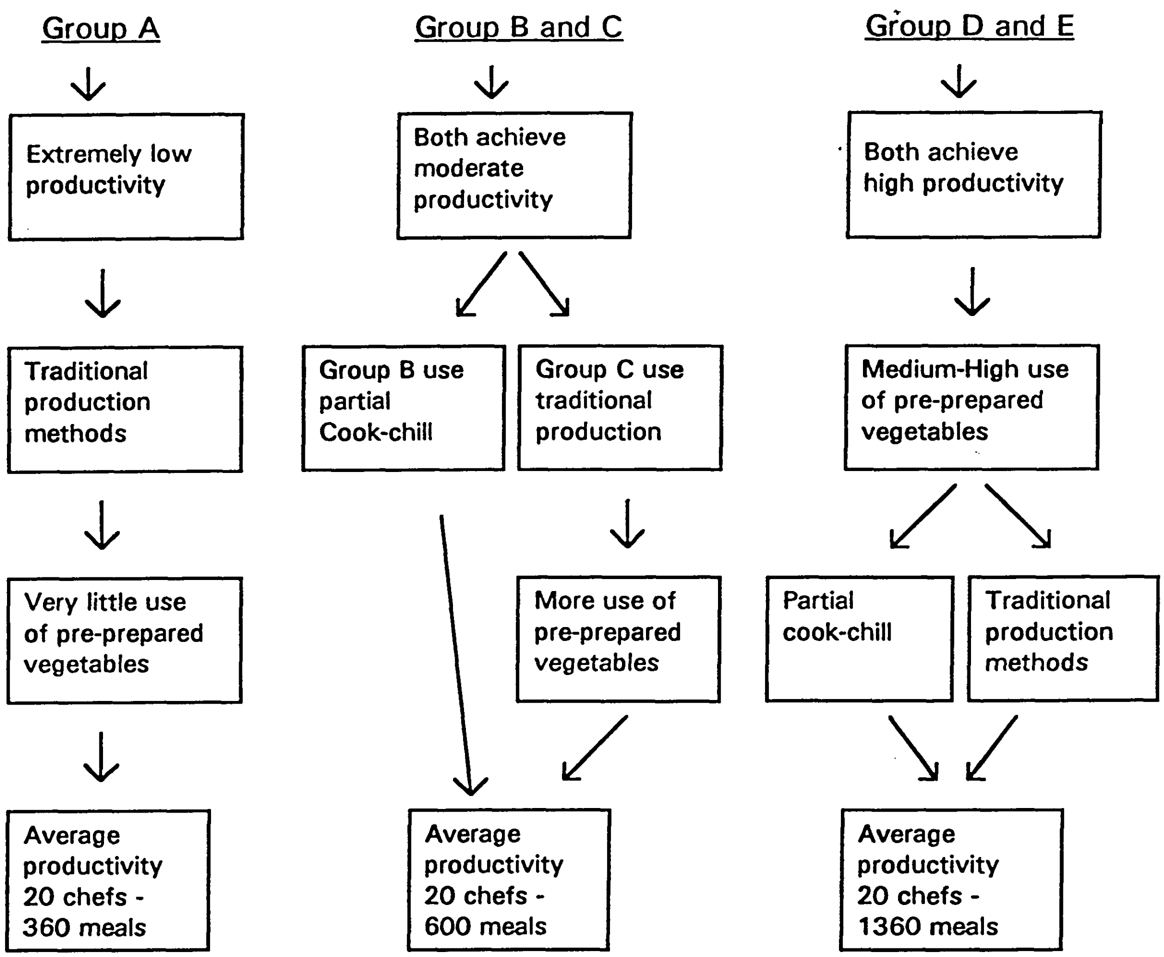
Figure 6.3.2 Productivity Model **Hospitals**



(Source Page 199 Hospitals Typography, Section 5.12)

From this analysis it can be confirmed that the use of pre-prepared vegetables alone can increase productivity, but by the use of cook-chill with pre-prepared vegetables significant gains in productivity can be obtained.

Figure 6.3.3 **Productivity Model** **Hotels**



(Source Page 200 Hotels Typography, Section 5.12)

From the analysis (figure 6.3.3) it seems clear that Group A using traditional production methods and few pre-prepared vegetables achieve low productivity. With Group B partial cook-chill, particularly with the use of pre-prepared vegetables does have some impact on productivity within Hotels. However, in Group D and E the analysis shows that where pre-prepared vegetables are used both in partial cook-chill or traditional production systems increases in productivity can be achieved.

This can be explained by the large numbers of chefs employed within the five star hotels traditional production kitchens. Also a consideration of cost and image factor is relevant here. I believe that the lower increases in productivity demonstrated by hotels when compared to hospitals is due to the productivity of traditional systems being overstated. (As seen in Case Study 1, Section 4) here staff were working 70 hours a week for 40 hours pay, giving a misleading indication of the productivity being achieved. Traditional production alongside cook-chill is diluting this labour intensive sector, although in five star hotels a wide menu choice has to be provided.

Total revenue and its effect on productivity is an issue in hotels as well as in hospitals, but within five star hotels the ratio of staff to guest is still high to satisfy customer expectations of service. True benefits come when large numbers of people are served with a restricted range of menu items whether in hotels or hospital catering.

6.5 Use of Pre-prepared Vegetables

One major aspect of productivity that is beneficial to all managers in both spheres of catering (hospitals/hotels) is the use of pre-prepared vegetables. The cost of purchasing these is only marginally higher than fresh vegetables and reduces the number of staff. (See Case Study 1, Section 4) where two apprentice chefs had not been replaced as the hotel now purchase ready-prepared turned vegetables.

It is feasible that the extra cost (possibly as low as 30%) of using pre-prepared vegetables in place of fresh vegetables can be absorbed in the food costs and hence the selling price. Therefore this process of using pre-prepared vegetables could reduce overall labour costs.

In most hospitals (82% in the survey report) at least 50% of vegetables are bought ready prepared. Clearly the extra cost is seen to be justified by increased productivity. This also contributes to a consistent product for quality control. This is substantiated by questionnaire results for Hospitals (figure 5.2 and 5.4, Section 5) which shows an average productivity of 3577 meals per day by 20 chefs amongst heavy users (38 hospitals) of pre-prepared vegetables. This is more than 50% increase in productivity over the hospitals (22) who are light users of prepared vegetables. The difference between these two groups in hospital catering confirms this significant increase in productivity from such a simple change of practice. This increase is also emphasised by hotels using pre-prepared vegetables although the increase in productivity is not so large (Hotels Figure 5.3 and 5.5, Section 5).

With pressure on budgets in the private and public sector, interest in productivity is widespread. Many hospitals have studied the possible use of cook-chill catering systems. Little attention has been paid to the benefits of using pre-prepared vegetables, which this survey shows to be capable of producing increases in productivity, possibly as important as the installation of a cook-chill system. A further advantage to using pre-prepared vegetables is that no significant changes in working practices are required, although the use of specialised equipment would be to the caterer's advantage (namely pressureless steamers or combination ovens).

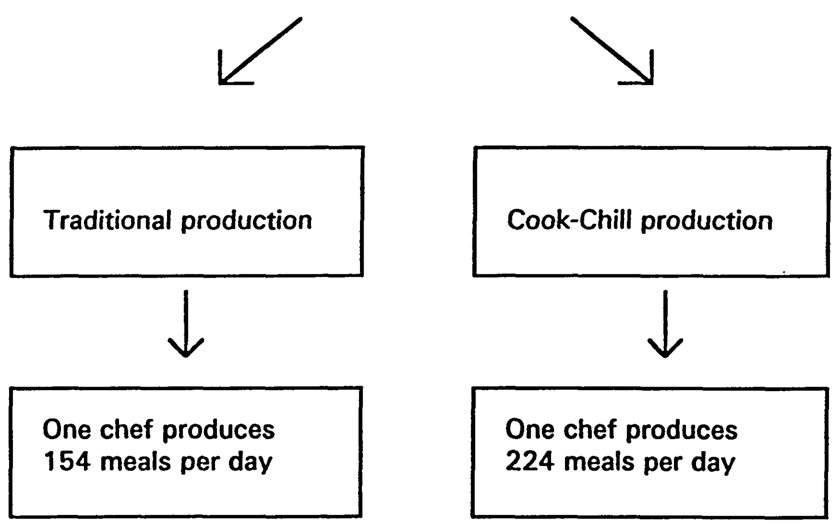
6.6 Catering Technology

There is an increased demand for multi-skilling from all aspects of the hotel and catering industry especially as new catering technologies cut across traditional occupational and skill boundaries in the production kitchens. Some authors in the literature review predicted that using catering technology would have an adverse effect on the hotel and catering industry. However, results from this research imply that using technology correctly can achieve better productivity, enabling staff to work with the required skills efficiently and economically and offers them a better work environment. Technical innovation in the catering industry is necessary to maintain growth and the ability to satisfy expanding markets.

However, the relationship between technology and traditional kitchen skills is complex and because of this, the defence 'machines are taking over' is often made from traditional chefs who feel threatened or untrained in the ways in which catering technology can be used as a labour saving mechanism to conserve time and energy. It would seem that some chefs (Case Study 6, Section 4), perceive new technology as a mechanism that takes away traditional skills and disrupts their existing work practices, making their job more boring, and meaningless. A counter argument may regard new technology as essential. It can take over many heavy, routine and tedious tasks, allowing chefs to concentrate on the skills, techniques and individual judgement to maintain or increase quality control, thus enhancing productivity and experience of production work. It can also reduce employee stress through decoupling production and service.

An analysis of the data clearly shows that by using catering technology, productivity by chefs can be increased. For example comparisons within hospitals (Graphs 5.11 and 5.13, Figure 5.4, Section 5) an increase in output can be shown.

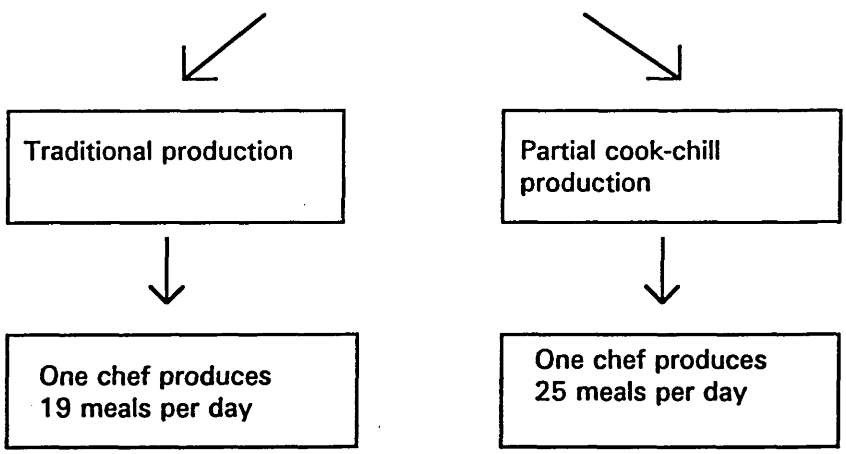
Figure 6.6.1 <u>**Technology and Productivity (Hospitals)**</u>



(Source: Graphs 5.11 and 5.13.)

This shows a substantial increase in productivity (35%). Possibly the combination of high levels of production and limited menu choice are ideal for the introduction of cook-chill. The percentage productivity increase is similar (32%) for hotels (Graphs 5.26 and 5.27, Section 5) when using partial cook-chill (Figure 6.5.2) the improvement is more limited but still substantial. This shows that when cook-chill is used fully or in partial production for patients, banquets or function catering with a limited menu offered, production output increases. Also quality control and excellence of meals can still be maintained or enhanced for both hospitals and hotels. At the same time energy and labour needs are reduced.

Figure 6.6.2 **Technology Productivity (Hotels)**



(Source Graphs 5.26 and 5.27)

6.7 Catering Technology Process

Although the models emphasises the benefits of cook-chill for increasing productivity there are other factors to be considered within the cook-chill process - (whether it is used fully or as a partial production system) - when compared with a traditional system. From the Case Studies (2,4,5 and 6, Section 4) where cook-chill is used, staff experience a better working environment with less working pressure than normally found within the fluctuations of a traditional production system.

Within the purpose built central production units or purpose built preparation areas (Case Study 2 and 5, Section 4) staff benefit from a temperature controlled environment where the food is prepared, cooked, chilled and stored in a hygienic atmosphere.

This can be contrasted with Case Study 4, Section 4, where the cook-chill production system has been converted from a traditional kitchen, and suffers from too many entrances and exits for non-production staff (despite the operation of a restricted entry rule). There is a lack of control over the environment. This does not provide the enclosed environment (both for temperature control and employees) required within C.P.Us to prevent cross contamination of food. Also the staff in Case Study 4 had to work within a poor ventilation system. A well ventilated system not only helps to prevent food spoilage but also benefits staff, as having to actively work in a hot atmosphere produces fatigue (Schneider 1988) and possibly affects productivity and quality control (Johns Wheeler and Cowe 1992). Where the working environment had been re-planned and given a good aesthetic appearance and computerised ventilation system, (Case Study 2, Section 4) the staff employed seemed to be far more relaxed, even at the height of production, than staff employed in a poor working environment.

Another important aspect in favour of cook-chill is a reduction in plate waste, traditionally high within the hospital sector, as portion control can be monitored more accurately. (Case Study 3 and 4, Section 4).

In some central production units (Case Study 5, Section 4) productivity does not reach its maximum output owing to lack of financial resources to expand both the facilities for chilled storage and the packaging process. (An even more limited use of the cook-chill system, confined to one particular unit, is seen in Case Study 4, Section 4). It would seem that this restriction on full utilisation is a limiting factor on maximising profits potentially obtained by selling meals to other hospitals or health care units. It would also be feasible to supply units outside the sphere of the National Health service if more funding were available. In fact no other section of catering seems to offer as much growth potential in the public sector as Health care, as large commercial contractors already involved in hospital catering wish to capitalise on this expanding market ("Caterer and Hotel Keeper" August 1993). No doubt the future use of catering technology within hospitals will change with possibly a mobile cafeteria service offered to patients at ward level or chilled meals offered as part of a "pay as you eat" vending system to be taken at the patients leisure.

Although it was emphasised that a reduction in total staff numbers was not entailed in the cook-chill production system it was noted (interview with Mr Reid) that skilled staff numbers had sometimes been reduced. The data for hospital catering (Section 5) confirms that less skilled staff are needed for a cook-chill production system, with no increase in auxiliary staff either. The important factor of quality control can still be maintained.

One important aspect which was emphasised repeatedly within interviews (Case Studies 4,5 and 6, Section 4) was that training or re-training of staff, either within educational establishments or on the job, on how to use catering technology, is essential to achieve productivity and maintain quality control of all menu items. The crucial factors in the proper use of technology should be 'why' and 'how' to use it. This raises issues of work organisation and training of chefs within the industry and those entering it. Possibly lack of knowledge regarding catering technology discourages chefs from entering into production systems where cook-chill, sous-vide or cook freeze-thaw may be in use.

Significantly the most successful cook-chill units had spent a higher proportion of expenditure on training and research developments (Case Study 4 and 5, Section 4) than the less successful units stated in (Hospitality 1988).

Inadequate investment in training and poor communication for users will be a major problem for the hotel and catering industry as modern technology will be developed further to off-set labour resources. Therefore chefs need to be trained and informed more fully of its advantages in order to develop their skills around technological systems.

6.8 Determination of Kitchen Layout and Equipment

6.8.1 Kitchen Layout

Kitchen planning and layout is a complicated and diverse subject area. There are many different viewpoints to be taken into consideration. An ideal kitchen for one chef may be totally wrong for another, as work methods differ between people. The main criteria are to ensure as far as possible that work flows logically around the kitchen, along the shortest feasible route, and that staff are working in an area that is safe, hygienic and offers good ventilation.

Overall the production kitchen is still traditionally designed and layout is planned by catering equipment specialists who have ulterior goals in selling a package of equipment not necessarily in the chef's best interest. This may bring about for example (Case Study 8, Section 4) restrictive movement, limited flow of work and in some instances a potential safety hazard, with equipment too close together or placed above the reach of the user. The design and layout of equipment affects the worker physically and mentally and these factors are therefore important as design criteria. It would seem that design based on human factors helps to reduce or eliminate the external factors that can cause employee dissatisfaction and is also an important issue to consider in the attempt to prevent staff turnover (Woods and Macauley 1989).

The problem of inadequate design has been with us for many years. The basic problem is that design is usually carried out by people either with ulterior motives or who do not understand technological catering systems.

6.8.2 Equipment

From the survey (figure 5.1) it is clear that modern versatile catering equipment is needed and appreciated by aware chefs. Consultation with the chef by designers and planners is required on practical issues such as the adequacy of work flow and of space for individual team movement. (It was noted in Case Study 1 and 8 section 4 that space requirements were not adhered to in the pastry/production section, as is no doubt the case in many other kitchens too). The introduction of new design concepts within a kitchen with the aim of utilising equipment and space effectively, is of great concern to the staff working there who may not have their requirements met, or even considered sufficiently, to allow optimum performance.

Equipment is available to improve productivity and profitability in the Hotel and Catering industry as well to improve work conditions and environment. The equipment in use for both hospitals and hotels was extensively reviewed with questions determining the number of each type used. For each type of equipment further questions determined the perception of the respondent of its effect on productivity and the working environment, and whether perceived to be labour saving. From the survey it was found that modern catering equipment was fairly well established although in some cases only few items were in use because of cost.

Overall, multi-purpose equipment was appreciated by the user for speed, efficiency, and productivity with generally good results (see appendix 4). It was noted (Case

Study 4, Section 4.6.8) that it was possible to reduce 40% of the existing equipment by obtaining specialised multi-purpose equipment, allowing a better work flow and an improved working environment without excess heat into the atmosphere. Typically a 'good' selection of equipment to aid productivity could consist of combination ovens/or convection ovens used in conjunction with pressureless steamers, cool-zoned fryers (although baked oven chips are becoming popular to decrease the smell of fat into the environment) and combination microwaves that cook and brown dishes although the throughput has limiting factors for production at the moment. Bratt pans are most versatile and are now manufactured in various sizes so that models can be used within most types of kitchens. Food processors also need to be used more to benefit the chefs time and energy. Also induction or halogen hobs need to be considered as an essential item for future planning, to save on energy resources. Although the price of equipment and lack of resources is a major problem for many establishments it is worth noting that rescheduling or planning a better layout of kitchens with existing equipment would in many cases produce better results and productivity gains

Certainly in smaller units (Case Studies 7 and 8, Section 4) better planning and layout with knowledgeable use of the kitchen equipment would improve output and quality control.

Another way of using the establishment's own equipment more economically for labour, time and energy resources, would be by reducing the amount of traditional cook-serve production, with the use of cook-freeze/thaw that is being operated by some large food manufacturers. (This new catering system came into operation during this research, although the food manufacturers and the hospital concerned were visited this process was outside the scope of this research). But even here staff training is essential for proper quality control.

6.9 Organisational Change

Increased productivity and the technological processes available to the Hotel and Catering industry have proved to be the major discussion point of this research. But all of these processes cannot take effect without change. Change in most situations is intended ultimately to benefit an organisation. However, this is not always the result. As change is often met with fear and uncertainty, it becomes a true challenge for the manager to implement change successfully. Staff accustomed mainly to traditional production methods need to adapt both their attitude and skills to take advantage of the modern catering techniques of computerised/multi-purpose equipment.

Education and training needs to be implemented to enable staff to move away in their thinking from the traditional cook-serve methods and to conceptualise the modern systems of cook-chill or sous-vide that are more allied to manufacturing techniques than Escoffier's kitchen brigade. Cook-chill or sous-vide enhances rather than detracts from the chef's own skills as the end product has to be of a comparable or higher standard to be acceptable to the consumer. Bennis (1969) agrees that training has to be an ongoing process, as employers' knowledge or present work experience becomes obsolete or develops.

The hotel and catering industry has traditionally placed great reliance on young employees. If in the future this human resource is heavily targeted by other manufacturing or service industries, then the hospitality industry will be disadvantaged. As an industry it also suffers from excessive staff turnover (Woods and Macauley 1989 and Davies 1990). Therefore it would seem imperative for the industry to develop a strategy for ensuring a continued supply of suitably trained personnel. Only by addressing the predicament from within will the hospitality industry be prepared for a radical transformation of manpower planning designed to attract and retain talented mangers and multi-skilled operational employees. This can be obtained with a good team approach using various training and evaluation methods, (as outlined in Case Studies 2 and 4, Section 4). these training and communication skills used by management increased productivity and the staff's desire to achieve goals set by the management/staff team. This approach and the importance of involving staff/chefs with the planning process was emphasised in the interview with Mr Reid (Section 4).

The effectiveness of this approach complemented by a management style that is dynamic and interactive has been endorsed by a number of authors in the literature review such as Markowich (1971), Hilton (1992) and Sheard (1992). The "Caterer and Hotelkeeper" (April 1990) reported on the Castle Hotel in Windsor (Forte's) where the General Manager cut staff turnover by 40% in 18 months by 'doing right' by his 95 staff, by providing an environment of real opportunity, thus making the job more appealing to a wider range of people.

Overall this organisational change needs to be effected by using appropriate communication skills and direction to implement and manage the change process, not simply let it happen. The process of introducing change can be simplified through the skills of the manager informing employees from the initial stages when technology is being considered, not after its installation. For if change is recognised and analysed as the way forward for a specific hotel or hospital unit, a strategy can be formed to ensure effective implementation, to minimise employees resistance to modern technological change and thus increase productivity.

6.10 Implications for Industry

This research has shown that the use of catering technology, particularly within a cook-chill system, also using pre-prepared vegetables, increases productivity. But the technological base is constantly evolving within the industry for example with the introduction of cook-freeze/thaw, ambient temperature food holding. No doubt if halogen or induction hobs were more accessible (price wise) equipment changes would also happen within catering units.

To take advantage of changing technology in all its forms (production systems or individual equipment), today's managers or executive chefs have to encourage chefs to be adaptable and to look upon technology not as a threat to their profession but an asset which can enhance rather than diminish their skills. This change must be brought about with better education, training and communication both on the proper usage of modern equipment and on the operation of a diversified production process. Only if this occurs will the quality and standards expected by the consumer both within hospitals and hotels be achieved. Therefore it is essential that 'how' and 'why' these changes are needed are communicated to the chef and the consumer.

Within the confines of a focused M.Phil. it was impossible to investigate all aspects of productivity and catering technology. Future areas of research would contribute further to the corpus of knowledge. Future research within the area could productively include:

The necessity to compare and contrast productivity at a financial level within cook-chill and traditional production systems including investment considerations. Undoubtedly productivity gains can be achieved, but are these financially viable? The systems I came across ranged from modest investments to multi-million pound, purpose built central product units. Viability given this range of possibilities is a major issue.

To compare productivity and viability of different items of specialist catering equipment. During my research I realised that progress was being impeded due to lack of knowledge and expertise regarding new technology. This 'ignorance' translate into resistance to change. Research into performance and dissemination of equipment performance outcomes can help to overcome this. Whilst manufacturers provide equipment data, an independent 'audit' would command more respect and confidence.

Another area that is crucial to the industry concerns both productivity and quality. Therefore research needs to be carried out to assess high productivity food systems and equipment and their effect on food quality and the perception of food quality upon consumers. Within the hotel and catering industry, researchers need to explore the means, by which productivity and multi-skilling can be implemented successfully to the benefit of managers, employees and customers. The area of customer perception is an important factor. Current knowledge needs to be enhanced.

Overall this research project should prove beneficial to the hotel and catering industry. Mainly it emphasises the importance of catering technology as an aid to productivity, and provides encouragement to its uptake. At the same time its introduction needs to be carefully managed. Systems need to be carefully designed by those who understand them. Staff must be fully involved, educated and trained in the metamorphosis from traditional to high or low technology production systems. Only if this happens will the true productivity benefits of increased technology actually be achieved.

SECTION 7

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7. REFERENCES

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SECTION 8

APPENDICES

8.3 APPENDIX 1

SEMI-STRUCTURED INTERVIEW

A number of broad subject headings were used whilst interviewing both the public and private organisations. Although numbered, the sequence of questions varied due to the different aims, objectives and structures of the private and public organisations; the questions were tailored to the relevant situation.

1. Type of production system used.
2. How long in operation and modification (if any).
3. Type of equipment used and purpose.
4. How old is the equipment: problems encountered.
5. Choice of equipment - after sales service.
6. Purpose of the kitchen layout - flow of work (self designed or designer planned).
7. How many staff employed, rates of pay, length of service, turnover of staff, why?
8. Formality of kitchen brigade (flexibility).
9. Type of menu produced.
10. Type of commodities purchased (fresh-frozen).
11. Type and use of vegetables fresh-prepared.
12. Location of dry storage - chilled or frozen items.
13. Control techniques - quality assessment.
14. Storage monitoring.
15. Ventilation systems, humidity level for staff and food.
16. Staff recruitment, staff training.
17. General turnover of staff.
18. Budgetary control, plate waste
19. Cost factors.
20. New legislation - how it affects staff, knowledge, retaining information.

21. Benefits of open plan kitchen if any.

22. Staff perceptions of kitchen environment.

23. Communication for staff and customers using cook-chill.

24. Problems using cook-chill, regeneration of food.

25. Comparisons of traditional and cook-chill production.

26. Staff perception of cook-chill. Benefits, problems.

27. Future plans.

Listed below are the people consulted and interviewed whilst collecting information for this thesis.

Savoy Hotel - London	
Mr A Edelman	Executive Chef
Mr R Thomas	Sous Chef
	Pastry Chef
	Larder Chef
	Commis Chef
Dorchester Hotel - London	
Mr Willi Elsener	Executive Chef
	Sous Chef
	Larder Chef
	Banquet Chef
	Commis Chef
Browns Hotel - London	
Mr Peter Morton	Executive Chef
	Food and Beverage Manager
Mount Royal Hotel - London	
Mr Leo Lyons	Executive Chef
	Food and Beverage Manager
The BAFTA Centre	
Mrs Hilary Yard	House Manager
London Clinic	
Mr Ernest Brooksbank	Catering Manager
Birmingham	
Mr D Reid	Regional Catering Adviser
Mr N Watson-Jones	Deputy Regional Catering Adviser
Mr Thompson	Catering Manager, Queen Elizabeth Hospital
Mr Evans	Catering Manager, Queen Alexandra Hospital
Burton Upon Trent	
Miss Johnston	Catering Manager
Mr Philips	Head Chef
Mr Jones	Quality Control Officer

Moor-Vulcan	
Sheffield	
Mr M Snowball	Marketing Manager
Sherwood Inns - Whitbreads	
Mr A Barbour	Catering Operations Manager
Mr & Mrs Tebbitt - Managers	Brewers Tavern
Mr & Mrs Cranston - Managers	Brewers Fayre
Moffat Appliances Ltd	
Mr L Braintree	Birmingham
Hobart Mfg Co Ltd	
Mr T Clifford	London
Gardner Merchants Ltd	
Mr L Bond	Manchester
Foster Refrigerator (UK) Ltd	
Company Rep	Norfolk
Brake Brothers (Frozen Foods) Ltd	
Mr N White	Production Manager, Ledsham Unit

City Polytechnic

School of Leisure and Food Management

Pond Street
Sheffield S1 1WB
Telephone 0742 720911
Direct line 0742 533325
Fax 0742 533343
Telex 54680 SHPOLY G

Director
Elizabeth Rick BA MSc

May, 1991

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CATERING EQUIPMENT QUESTIONNAIRE

Could you please complete the following as I would like to formulate an appraisal of equipment needed/used by the catering industry. Please return it to me in the stamped addressed envelope.

Many thanks.

John Clark
Senior Lecturer in Food Management

This survey is to assess whether modern equipment/cook-chill is used partially or fully in your production kitchen.

Please tick the appropriate box or give your comments.

1. What total number of meals per day do your provide?

   (Total) ________

2. How many chefs/commis chefs/assistants do you employ? ____________

3. Equipment used:

	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Convection ovens		YES	NO	YES	NO	YES	NO
B. Conventional ovens		YES	NO	YES	NO	YES	NO
C. Combi ovens		YES	NO	YES	NO	YES	NO

4.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Conventional deep-fat fryers		YES	NO	YES	NO	YES	NO
B. Cool-zoned fryers		YES	NO	YES	NO	YES	NO
C. Computerised fryers		YES	NO	YES	NO	YES	NO

5.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Combination microwaves		YES	NO	YES	NO	YES	NO
B. Ordinary microwaves		YES	NO	YES	NO	YES	NO

6.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Pressurised steamers		YES	NO	YES	NO	YES	NO
B. Conventional steamers		YES	NO	YES	NO	YES	NO

7.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Bratt pans		YES	NO	YES	NO	YES	NO
B. Boiling kettles		YES	NO	YES	NO	YES	NO

8.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Grill		YES	NO	YES	NO	YES	NO
B. Charcoal grill		YES	NO	YES	NO	YES	NO
C. Griddle		YES	NO	YES	NO	YES	NO

9.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Chiller		YES	NO	YES	NO	YES	NO
B. Blast freezer		YES	NO	YES	NO	YES	NO

10.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Food processor		YES	NO	YES	NO	YES	NO
B. Veg. preparation machine		YES	NO	YES	NO	YES	NO
C. Bowl chopper		YES	NO	YES	NO	YES	NO
D. Vacuum Packer		YES	NO	YES	NO	YES	NO

11.	How many Number	Improves Work Environment		Improves Productivity		Labour Saving	
A. Induction hobs		YES	NO	YES	NO	YES	NO
B. Halogen hobs		YES	NO	YES	NO	YES	NO

12.

A. What proportion of potatoes do you buy ready prepared?

0%   25%   50%   75%   100%

B. Do you buy chipped potatoes ready prepared?

0%   25%   50%   75%   100%

C. Do you buy fresh vegetables ready prepared, e.g. carrots?

0%   25%   50%   75%   100%

13. Which production system do you use?

A. Conventional kitchen production ☐

B. Partial cook-chill production ☐

C. Full cook-chill production ☐

14. If YES to 13A

What are your future plans? (please tick)	More specialised Equipment	Considering a cook-chill operation	Remain as you are
	☐	☐	☐

15. If YES to 13B and 13C

A. How would you assess this production system? Re: Work environment	Needs Improvement	Satisfactory	Highly Satisfactory
B. Does it require less floor space?	No	A little	Noticeable Reduction
C. Has it reduced your total number of skilled kitchen staff?	No	A little	Noticeable Reduction
D. Have you been able to replace skilled staff with semi-skilled staff?	No	A little	Noticeable Replacement

THANK YOU FOR YOUR HELP

8.3 APPENDIX III

8.3.1 Food Production within the Catering Industry

Food production methods within the Hotel and Catering Industry have evolved over a long period of time. Culinary tradition and the concept of 'haute cuisine' play a major part in the thinking of many managers and chefs in all sectors (hospitals, industrial, public house catering, as well as hotels and restaurants). It is therefore important to consider contemporary trends within the context of this culinary tradition.

In large hotels and restaurants classic French food was produced by the 'partie system', perfected by Escoffier (1907). This system was based on the division of chefs into groups or 'parties' each responsible for their own section of the menu. As the division of labour was strict, there was a high ratio of staff to the number of meals produced by the kitchen. Since each department required its own area of kitchen and its own equipment, the size of the kitchen was large in relation to that of the dining room.

There was little change to the 'partie system' in the early part of the 20th century. Labour was cheap and only affluent people ate out, so prices were of little consequence. It is only in the last twenty-five years that changes in traditional methods have transformed the industry. As skilled staff demanded better wages and as space became in short supply and expensive, the traditional kitchen methods could often no longer be maintained due to the increased pressure on labour costs.

During the passing years the 'partie system' has undergone many modifications, most of them prompted by technological advance. The possibility of buying raw materials in various stages of preparation, also technological innovation in equipment has enabled chefs to be less restricted to particular areas of the 'partie' system whilst still retaining good control over the process.

Today's manager or chef will often be accustomed to obtain a range of food commodities from various manufacturers, saving on time and energy consumption. If the products' quality is assessed thoroughly before purchase, standards can still be maintained. This will affect work scheduling and can reduce the labour intensity of the industry.

The partie system is still being used in modified form. However, changes have slowly appeared, initiated mainly within bulk food production operations. Here it was difficult to keep up with demand, for example hospitals or school meal situations. Even in "call order " situations the development of "fast food" has demanded a radical rethink as to how food is prepared and cooked.

Traditionally food has been cooked to order within the hotel and catering industry, often prepared, cooked and served at allocated meal times on the same day. With the introduction of fast-food restaurants public demand has increased for quicker service and snack meals. Therefore it was necessary for production systems to change, within 'popular catering', as this area expanded rapidly to keep pace with the public's demand for eating out. Here convenience foods were incorporated with the use of modern technology into the menu.

Jones (1990) states "Unlike hotels, the food service section has benefited from technological innovation, which has improved their productivity."

Figure 8.3.1 Keynote publication 1992

1991	Public Houses		73,800
	Fast Food (Major chains)	)	
	Macdonalds	)	1,090
	Burger King	)	
	Kentucky Fried Chicken	)	

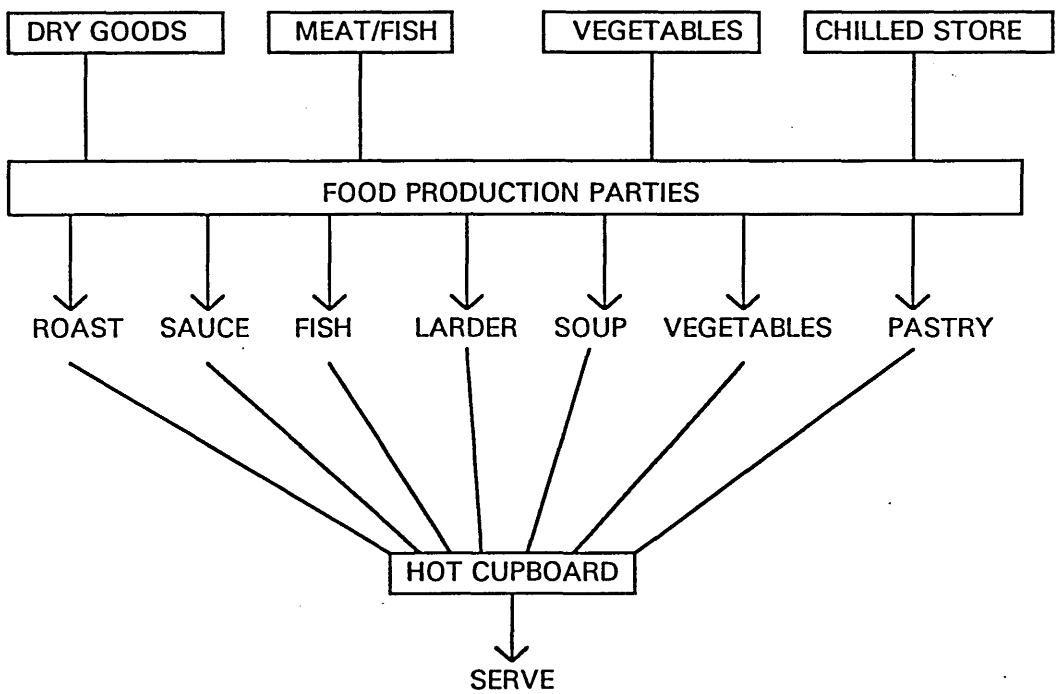
In bulk feeding operations the decoupling process was introduced with manufacturing catering companies producing ready foods or complete meals for the caterer to use. In 1966, the first 'cook-freeze' operation was developed in the UK. In the search for improved quality and reduced costs, cook-chill soon followed. The transition from craft to technology-based production methods was beginning to be apparent, particularly in institutions such as hospitals. The caterer was becoming aware of problems associated with 'batch' cooking, in particular hazards associated with quality loss during hot/cold storage and the risk of food poisoning.

8.3.2 Production systems

8.3.2.i Traditional Catering

Under the traditional 'partie system' food enters the kitchen in a raw state, and few convenience food items are purchased. Food is prepared and cooked to a specific recipe for á la carte or table d'hôte service with limited advance preparation. The food is cooked in a conventional manner, for example, French, Ethnic or British cuisine. Food preparation is labour-intensive, rising to a peak just before the service of each meal. Kitchen design/layout is usually of a central island design. Cooking equipment is used intermittently, for short periods, with overall poor utilisation. In some cases modern multi-purpose equipment has been installed to enhance performance. This equipment may then be over-utilised as too few are installed. Traditional catering methods also affect the use of electricity and gas appliances; these are often turned on in the morning and left on during the day, but only used for actual production for a few hours. "This emphasises the expensive operating costs of running a kitchen for labour, space, equipment and energy requirements." (Davies and Stone 1985).

Fig 8.3.2 Functional Layout for Traditional Production System

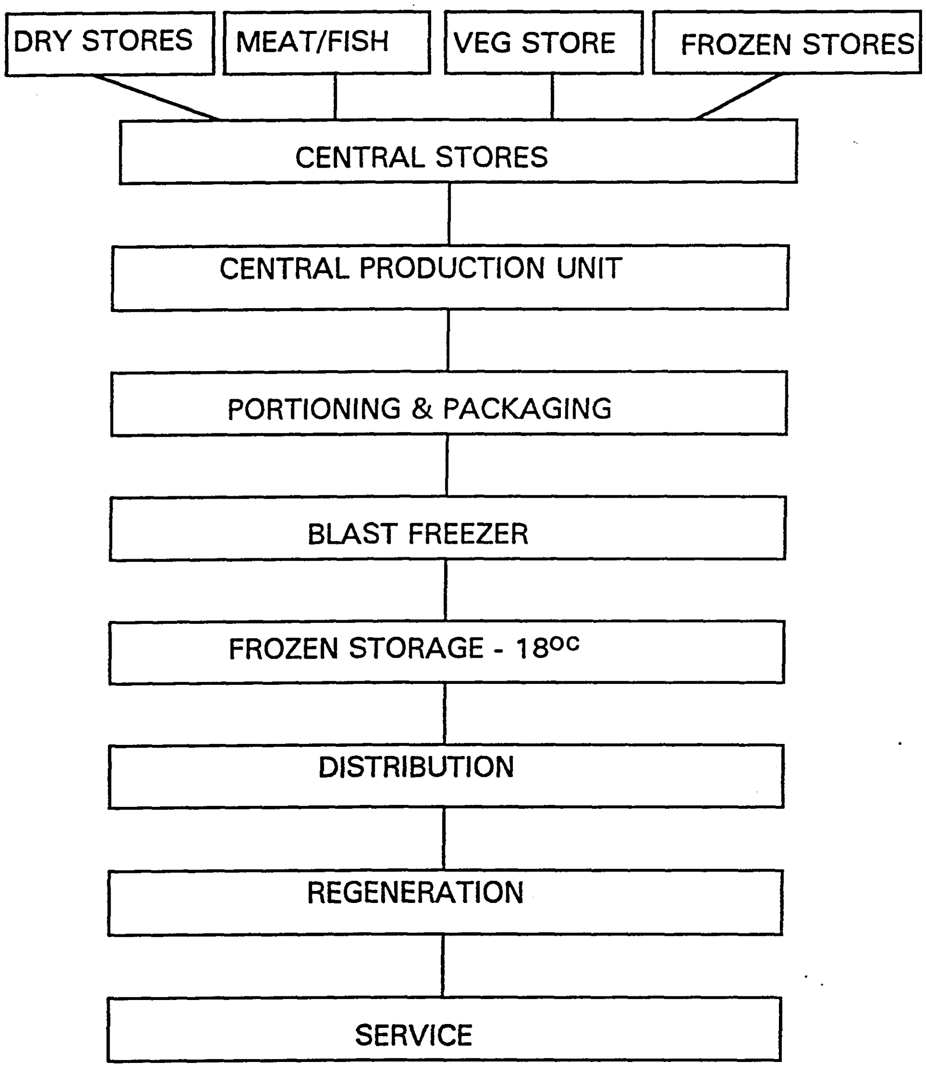


8.3.2.ii Cook-Freeze System

Food is prepared and cooked in a similar manner to conventional catering, after which it is quick-frozen. The food should reach a centre temperature of at least -5°c within 90 minutes of entering the freezer and subsequently should reach a storage temperature of -18°c (Dept of Health 1989, HMSO).

The food is then regenerated (i.e. receives its final cooking and heating) and served. This system is used for large-scale catering for example airlines, industrial, conference catering. The food is normally produced from a Central Production Unit with highly skilled staff to control food standards and monitor quality control. A typical process is shown in Fig. 8.3.3.

Figure 8.3.3 Layout for Cook-Freeze Production Process.



8.3.2.iii Cook-Chill System.

Procedure is similar to cook-freeze but instead of the food being frozen it is cooked and chilled under controlled conditions. Food should be subjected to an initial cooking treatment which will ensure destruction of any pathogenic micro-organisms present. The chilling process should commence as soon as possible after completion of cooking and portioning processes, and certainly within thirty minutes of leaving the cooker.

The food should be chilled to +3°c (a 2" layer of food) within a total period of one-and-a-half hours. Most pathogenic organisms will not grow below +7°c (Napleton 1990). However, maximum temperature of +3°c is required to reduce growth of spoilage organisms and to achieve the required storage life. Slow growth of spoilage organisms does take place even at this temperature (Kinderlerer 1990). For this reason storage life cannot be greater than five days.

Re-heating of the food should follow immediately after the removal of the food from chill conditions and should raise the food temperature to a level of at least 70°c. the food should be consumed as soon as possible and not more than two hours after reheating. The temperature before consumption must not drop below 63°c (Food Hygiene (Amendment) regulation 1989).

A temperature of 5°c/8°c should be regarded as the critical safety limit for chilled foods. If the temperature of the chilled foods rises above this level during storage or distribution the food should be destroyed.

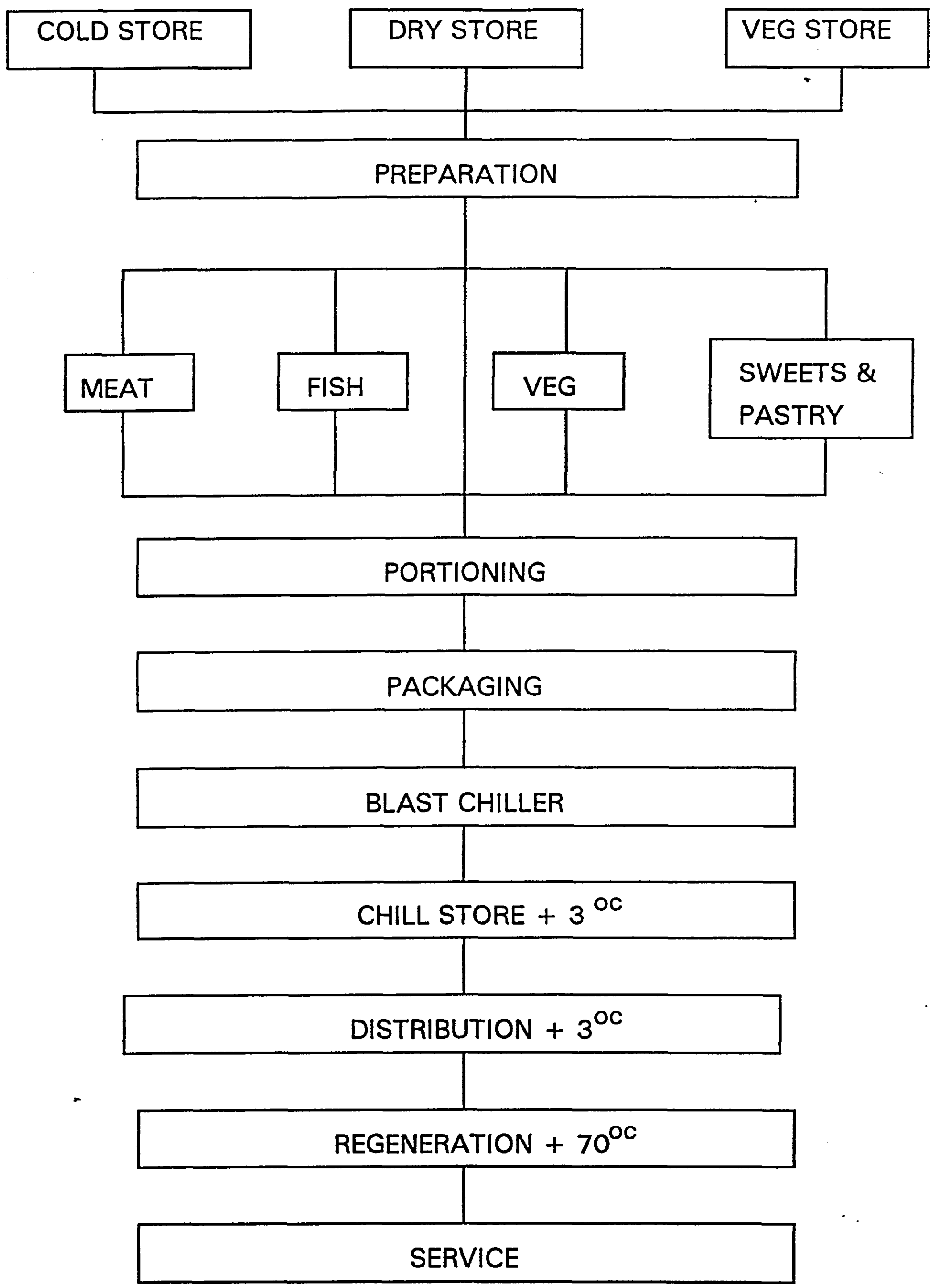
This catering operation has become beneficial to large institutions like the National Health Service (NHS), hotels and university catering. The skill of the chef has been retained. Many operations have found it is beneficial also to use the chef's knowledge and skill within menu planning and recipe evaluation as this involvement gives the chef a better insight into the procedures involved.

Compared to cook-freeze a full range of dishes can be offered and quality is favourable. Also cook-chilled food can be chilled with sauces produced in the conventional manner unlike the cook-freeze product which needs to be modified. In cook-freeze the freezing process affects the food with freezer burn and dehydration. Frozen meals also offer a restrictive menu due to the freezing process.

8.3.2.iv <u>The Cook-Chill Central Production Unit</u>

Figure 8.3.4 illustrates the simplest production process necessary. Heavy-duty catering equipment with good efficiency should be utilised whenever possible. Cook-chill uses less production equipment; however, the equipment is used more intensively than in a traditional production system as it is used on a manufacturing system with straight shifts for employees. Correct packaging equipment is needed to speed up the chilling storage process, especially if the food within the kitchen is not in a cool ambient temperature.

Figure 8.3.4 Cook-chill Production Process



8.3.2.v Finishing Kitchens: Cook-freeze/thaw

The majority of the food used in this catering system is prepared frozen dishes of the type obtained from a cook-freeze Central Production Unit or from a manufacturer specialising in dishes for the caterer. Some manufacturers have an excellent range of convenience frozen foods that can be used as a complete menu, as found in some NHS hospitals; and in many restaurants or public house catering, these can be used to complement or extend the menu, as well as providing 'core' dishes. This can also alleviate the problem of menu fatigue; a finishing kitchen approach can be useful if the kitchen concerned is too small for certain dishes and makes it uneconomic to produce these in large quantities. A finishing kitchen also reduces demand for highly-skilled chefs, and cooks with a limited knowledge of catering can be employed to regenerate and serve food.

8.3.2.vi Sous-Vide

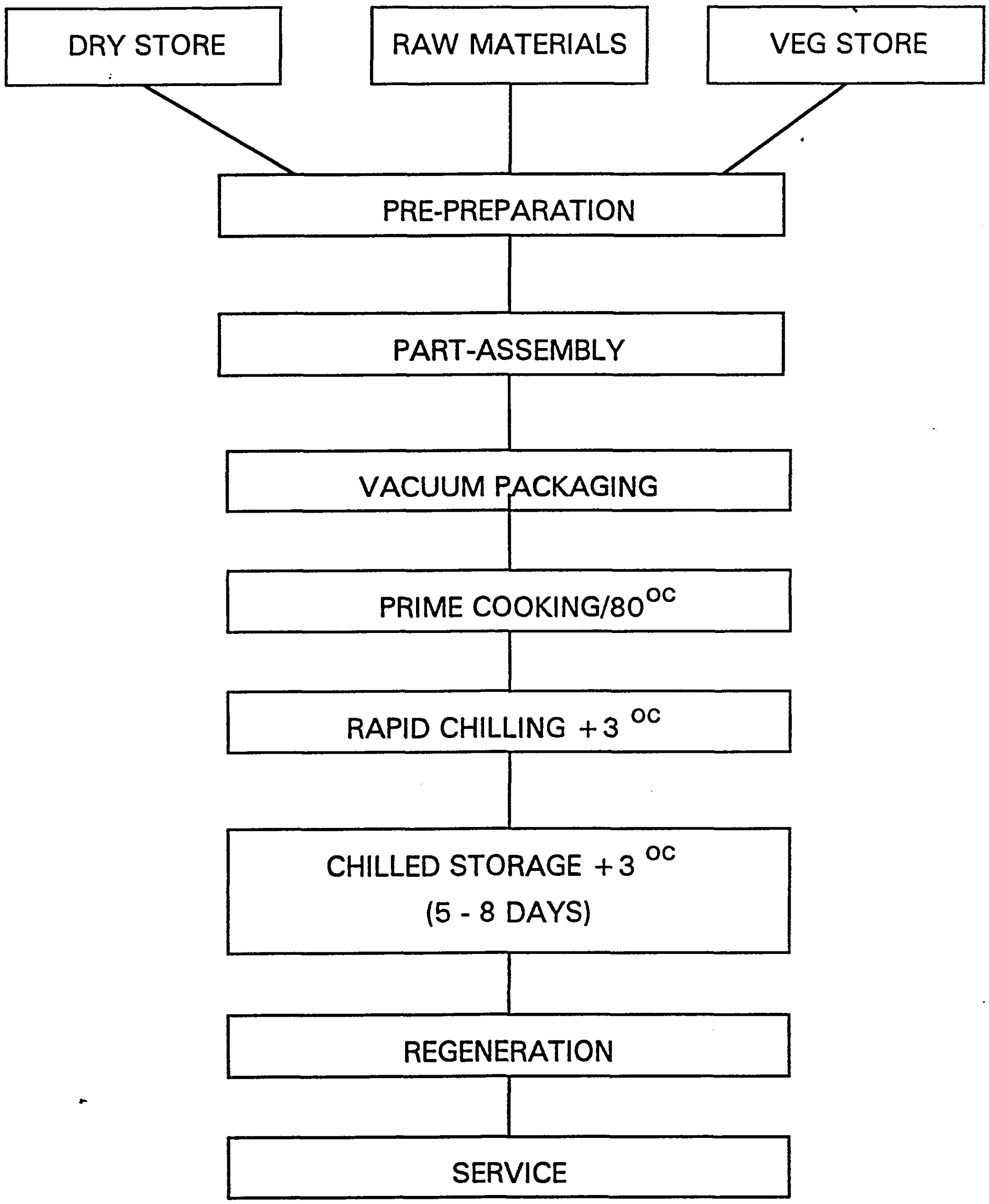
In 1984 the Roux Brothers introduced the British catering industry to sous-vide. Initially popularised by a French chef called George Pralus, it utilises vacuum packaging to prolong shelf life. The origins of sous-vide go back some twelve years. Pierre Troisgras, a famous French chef, was having problems with his foie-gras. He approached George Pralus, hoping that he could find a way of resolving weight loss of around 40%. Pralus' solution was to wrap the foie-gras in three separate layers of film and bake the terrine. He described the results of the experiment as follows:
"When I took the terrine out of the oven, two of the wrappings had burst, but the third had held. Three days later, we unwrapped the terrine, Troisgras turned out the contents; he cut it in half and the presentation had an extraordinary quality, weight loss of 5% and the foie-gras colour was unforgettable: sous-vide was born".

Pralus could see the potential of this method of cooking in terms of improved quality, reduction of weight loss and the extended shelf-life of foods. He has since worked to refine his process. "The next generation of cooks must cook with their heads as with

their hands". However, cooks must accept the technology and alter their attitudes towards hygiene, as disciplined production is absolutely necessary.
The production system of sous-vide cooking has now been refined and a typical system follows the processes set out in Figure 8.3.5.

At the present time there are no specific Department of Health guidelines for the caterer to follow although it is assumed that sous-vide should follow the cook-chill guidelines relating to storage temperature and maximum storage time.

Fig 8.3.5 **Sous-Vide Production Process**



Unlike the cook-chill process the individually portioned food item is cooked within a plastic pouch.. As a result of this cooking process the menu item will have:-

a) extended chilled shelf life, 5 - 21 days

b) enhanced sensory quality, retains flavour/aroma

c) enhanced nutritional quality, less vitamin loss

Research carried out states different views of possible shelf life. Schaffeille (1988) maintains that the sous-vide product cooked and stored under optimum conditions can have a shelf-life of 21 days; Sheard and Church (1992) suggest 8 days maximum shelf-life. The main criteria are that the products used must be of prime quality and the food, once sealed, must have a control package with a probe attached so that the whole cooking, chilling and storage process can be monitored correctly. As a production system it offers a good product. However, there are limitations. A number of menu items cannot be produced within this production system, e.g. pastry items, gateaux, as it is difficult to retain their shape. For the caterer it is essential that correct equipment (such as pouches) is used to ensure product quality, but this in turn can increase the cost to the consumer. (This may be a factor in determining why sous-vide is mainly used within 5 star hotels and expensive restaurants, as each dish is individually packaged.). It has the advantage, however, of making for easier storage, and provided the necessary strict rotation of items is observed, it does reduce the problem of cross-contamination.

8.3.2.vii Pub Food or Call Order Catering.

"Convenience foods", mainly frozen, form the basis for many of these catering outlets. The idea of this system is that simple food appears freshly cooked when the customer places an order. This has become one of the most popular forms of modern catering, with the consumer accepting the fast food image of the product and establishment.

This reflects a change in attitude towards eating out; the dining-out experience is now available to almost all sections of society and is no longer reserved for special occasions.

The general public appreciate the value-for-money and informal atmosphere offered within this food service system. Within this catering sector, menus are designed around a minimum range of high capacity equipment. This is often used to its maximum, as kitchen space has been reduced to allow a bigger seating area and a rapid turnaround of customers. Menu planning and good sales mix offers specific items at a relatively low % profit per dish. It is therefore essential that a fast turnover of customers is catered for in order to ensure an acceptable total contribution margin. Here today's catering has changed radically from the old traditional production. The restaurant now has the maximum space and the kitchen is reduced to minimum square footage. Modern catering technology has been introduced to achieve optimum food production through-put catering for the public demand for less formality and for lunch-time meals.

CONVECTION OVENS

Figure 5.1 Row 1 (Source Table 1)

Overall Utilisation

The research shows that 87% of hotels, 89% of hospitals see the convection oven as a popular item of equipment: a good overall performer with its fan-circulated hot air, it can achieve excellent results with pastry and roast items. The oven can be set at a lower temperature than conventional ovens and can also produce cooked foods in a shorter period of time, an energy saver for the caterer.

Reasons for Utilisation

1. Improve environment

According to the survey, 71% of hotels, 68% of hospitals agree that the convection oven is beneficial to the kitchen environment, as this oven can produce satisfactory results at a lower temperature setting, and can cook food quickly. It does not have to be turned on as early as conventional ovens, and this reduces the amount of heat generated within the kitchen, saving on extraction and the problems of excess heat/humidity for staff, but a good ventilation system is essential for the production area.

2. Improve productivity

92% of hotels, 79% of hospitals from the survey assess the convection oven as improving productivity. The majority of convection ovens have thermostats to control time and temperature in the oven and to measure the food temperature with a probe. With this versatility, a high standard of productivity is achieved. Hotels rely on convection ovens for a range of cooking methods (e.g. roasting, poaching, braising), where hospitals tend to use the steamer and the bratt pan for large joints of meat and braising items, particularly for the bulk quantities produced. But the convection oven is used to its full potential for baking and roasting foods, and produces higher productivity than conventional ovens (Figure 5.1, Row 2).

3. Labour Saving

The survey shows that 67% of hotels, 53% of hospitals view the convection oven as labour saving. Good temperature controls allow the staff to be more free to prepare and produce other food items, with the knowledge that the oven is capable of maintaining the heat at the set temperature, with a timer sounding when the item is ready, either set manually or with the use of a probe. This is an improvement over conventional ovens, where the chef has to rely on guess work or expert knowledge of the variance in each shelf heat, and must therefore be aware of the progress of the cooking process at all times, to prevent spoilage.

TABLE 1 - CONVECTION OVENS - Comparitive Utilization

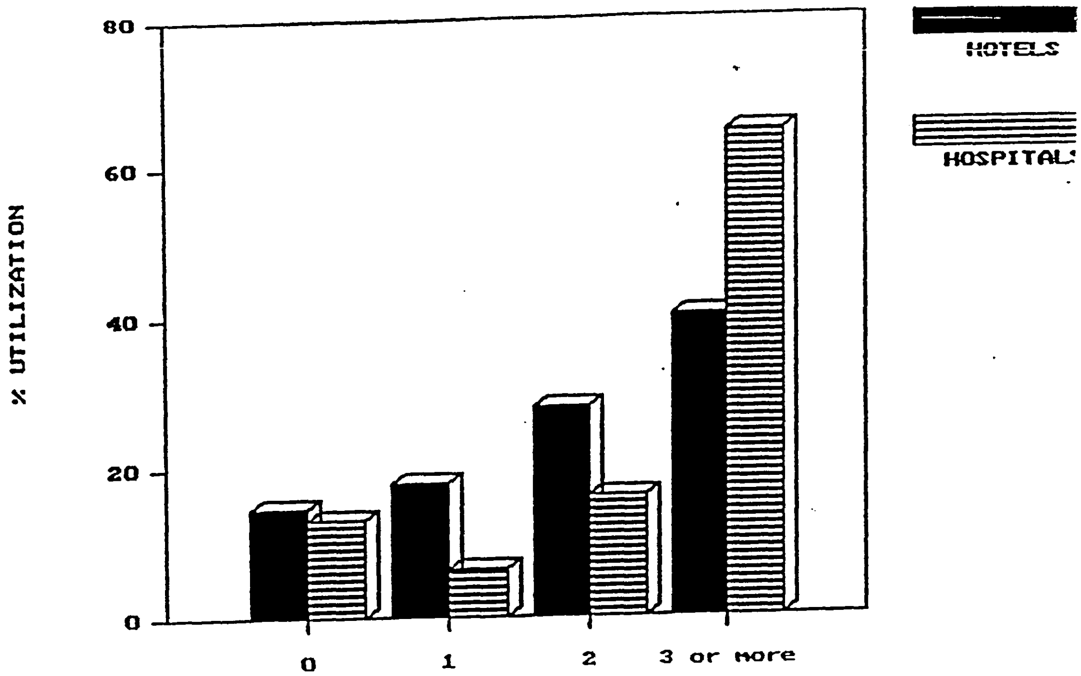


Figure 1 - NO OF OVENS

TABLE 1 - CONVECTION OVENS - % Utilizing one or more

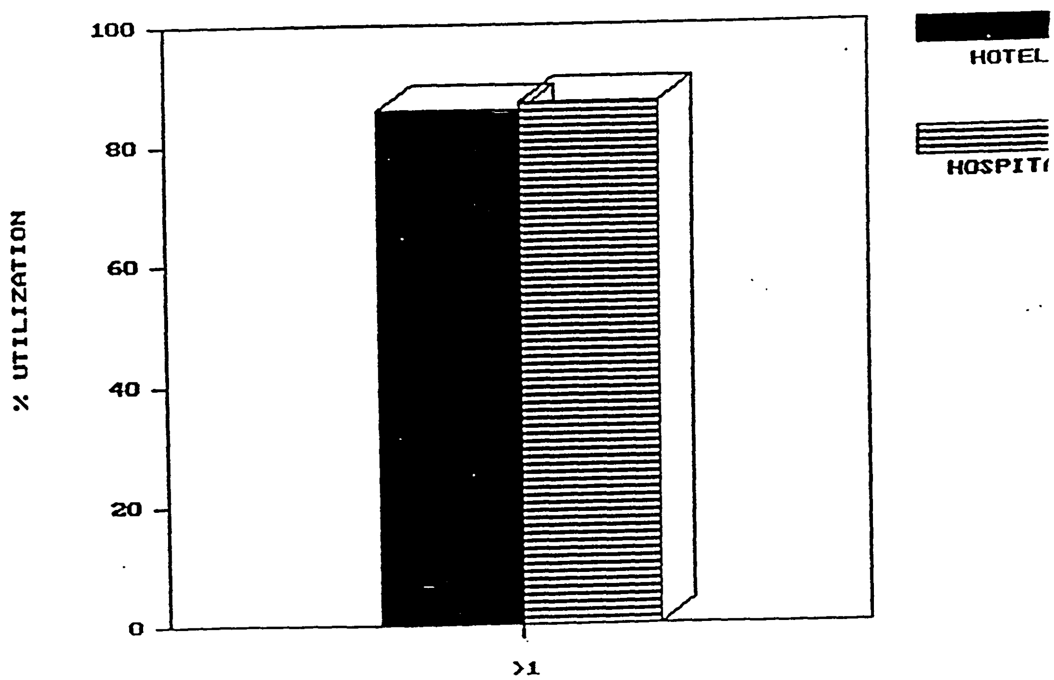


Figure 2 - ONE OR MORE OVENS

TABLE 1 - CONVECTION OVENS

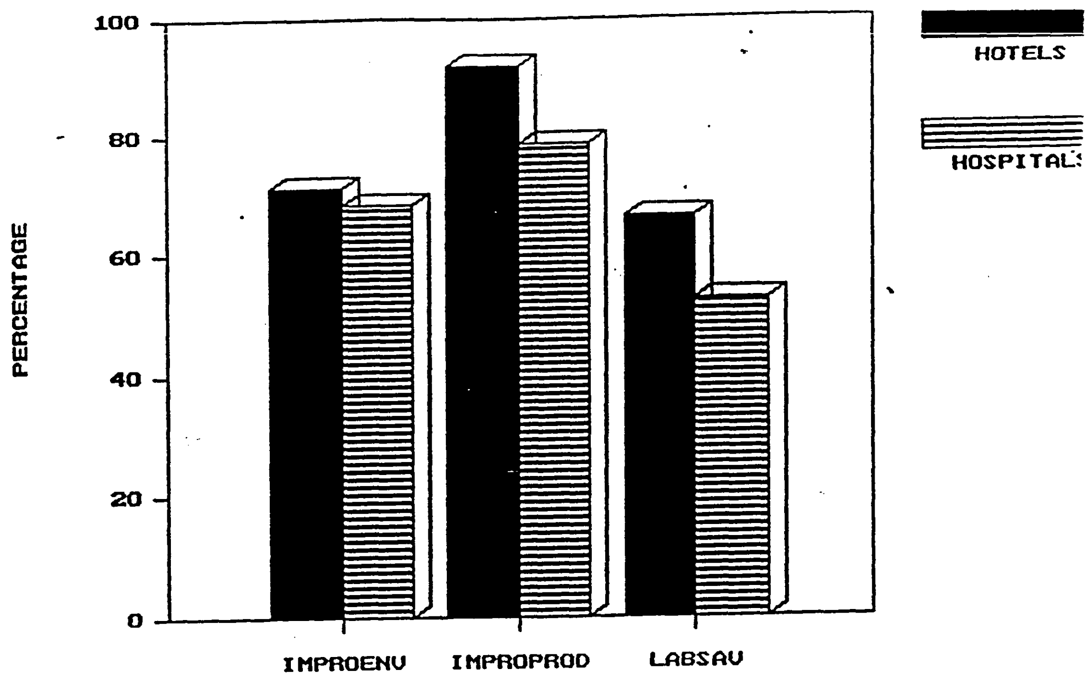


Figure 3

<u>KEY</u>

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

CONVENTIONAL OVENS

Figure 5.1 Row 2 (Source Table 2)

Overall Utilisation

The survey shows that 91% of hotels and 69% of hospitals produce food with conventional ovens. These have always been in use as multi-purpose ovens and are available to the caterer in various models and sizes, operating either by gas or by electricity. They are not as precise where the temperature control mechanism is concerned as the combi- or convection oven, and can be temperamental, so the user needs to know how to interpret the temperature settings and to learn which shelf is best used for the item being cooked. This is time-consuming for the staff, and therefore a disadvantage.

Reasons for Utilisation

1. Improve environment

Figures from the survey of 34% of hotels, 27% of hospitals show a very low rating for conventional ovens; these generate a lot of heat within the kitchen environment, and for the kitchen staff to work in a confined space near these ovens can be debilitating.

2. Improve productivity

The survey shows that 34% of hotels, 27% of hospitals report an improvement in productivity with the conventional oven; this is a low percentage, indicating factors such as the difficulty in assessing temperature control for the user, and the unevenness of cooking or coloration of foods cooked in this oven (unlike the convection or combi ovens).

3. Labour Saving

Again, low percentages assess this item as laboursaving (21% of hotels, 26% of hospitals). Although these ovens can be stacked, they are usually located under the solid-top stove, and this can cause back problems for the user when trying to place food in them at this low angle. Also, additional staff energy is required in the opening and closing of the oven door, which is normally hinged to drop down; this may be useful as a tray support, but suffers frequent damage and repair from the staff tendency to close it with a good kick.

TABLE 2 - CONVENTIONAL OVENS - Comparitive Utilization

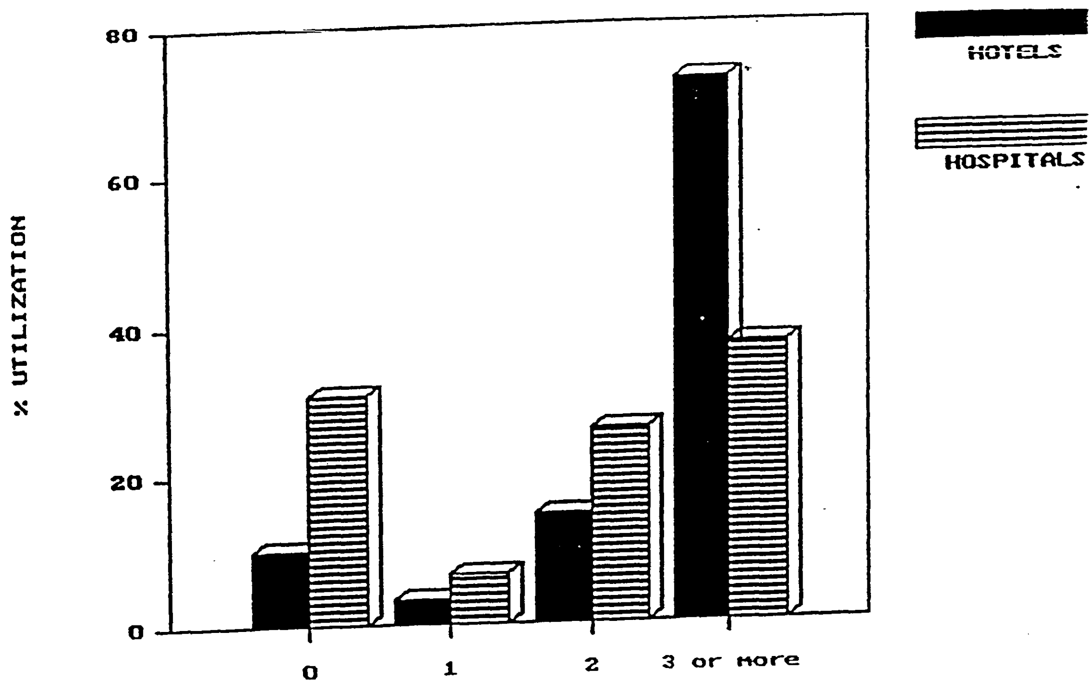


Figure 1 - NO OF OVENS

TABLE 2 - CONVENTIONAL OVENS - % Utilizing one or more

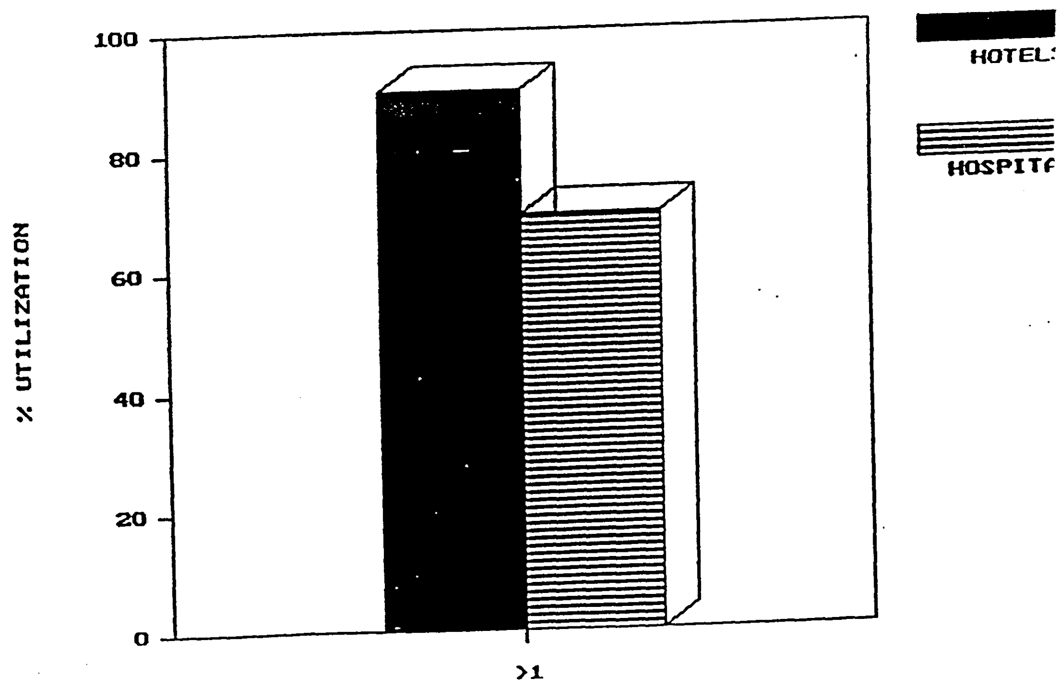


Figure 2 - ONE OR MORE OVENS

TABLE 2 - CONVENTIONAL OVENS

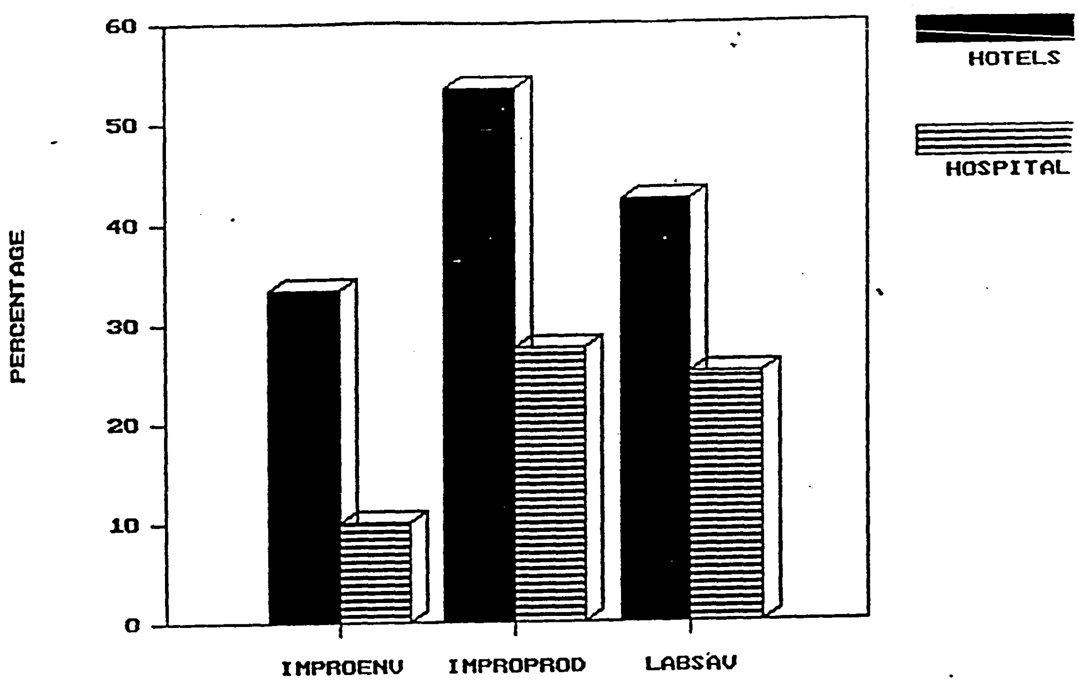


Figure 3

KEY

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

COMBI OVENS

Figure 5.1 Row 3 (Source Table 3)

Overall Utilisation

At the time of the survey, 55% of hotels, 47% of hospitals make use of combi ovens. A number of catering equipment manufacturers have produced combination ovens in various sizes, powered by either gas or electricity. The two main types available are the combination-steam-convection and the microwave-convection oven. The steam convection oven offers a good degree of versatility, allowing the chef to roast, grill, bake or steam food. It also utilises dry air and steam cooking methods together or separately. This is pre-programmed by the user, and some models are complicated, others simple to use.

Reasons for Utilisation

1. Improve environment

The survey shows that 87% of hotels, 98% of hospitals report an improved environment. Although there is still limited use within the catering industry of the combi oven, the results from the survey show overwhelming success for this versatile oven. They are easy to use once the various dials and symbols are understood and, unlike traditional ovens, they are at eye level, which makes for ease of movement for the user in carrying or lifting food; many of the recent models have built-in extraction hoods and are mobile, which improves the kitchen environment and cleanliness.

2. Improve productivity

96% of hotels, 98% of hospitals from the survey are satisfied that the combi oven improves productivity. The combination oven is one piece of equipment, as opposed to two, and this offers space saving within smaller kitchens. The cooking process is faster, without diminishing the quality of the food, which is a major asset to the cost-conscious caterer. With the majority of models a core temperature probe is provided. This is set to the required temperature and inserted into the centre of the food.

The oven automatically cuts off when the food reaches that temperature. This assists productivity, along with reduced shrinkage of meat when combining vapour with dry heat. This is considered an essential piece of equipment for all catering establishments.

3. Labour saving

The survey shows that 84% of hotels, 94% of hospitals assess this equipment as labour-saving. With the automatic cook and hold probe, the chef is enabled to cook food over longer periods, including overnight, which saves on energy consumption and staff time; this is especially beneficial to hospital catering, allowing secondary meats, for example brisket, to be cooked long and slowly. Within hotels the combi oven has been found to be invaluable for use within finishing kitchens, especially for banquets to cook/steam food in one process or to reheat food quickly to the required temperature just before service; unlike the more traditional method, where food is cooked and held in hot cupboards, sometimes for long periods, until required. With the combi oven, however, with its time-temperature control, this problem can be eliminated.

TABLE 3 - COMBI OVENS - Comparitive Utilization

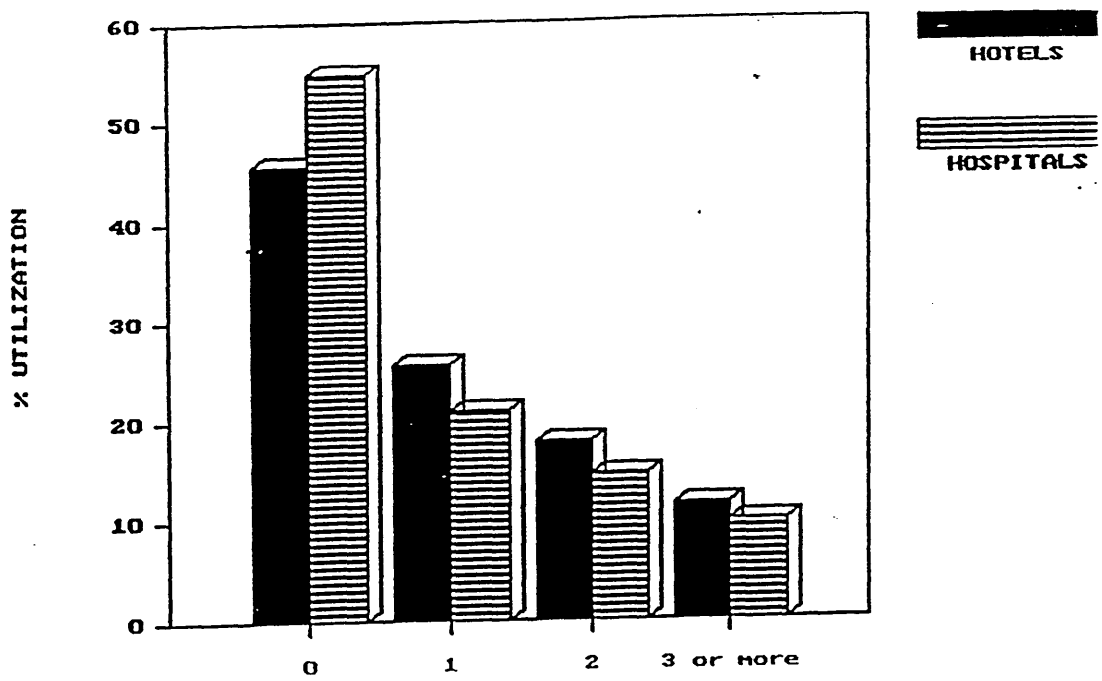


Figure 1 - NO OF OVENS

TABLE 3 - COMBI OVENS - % Utilizing one or more

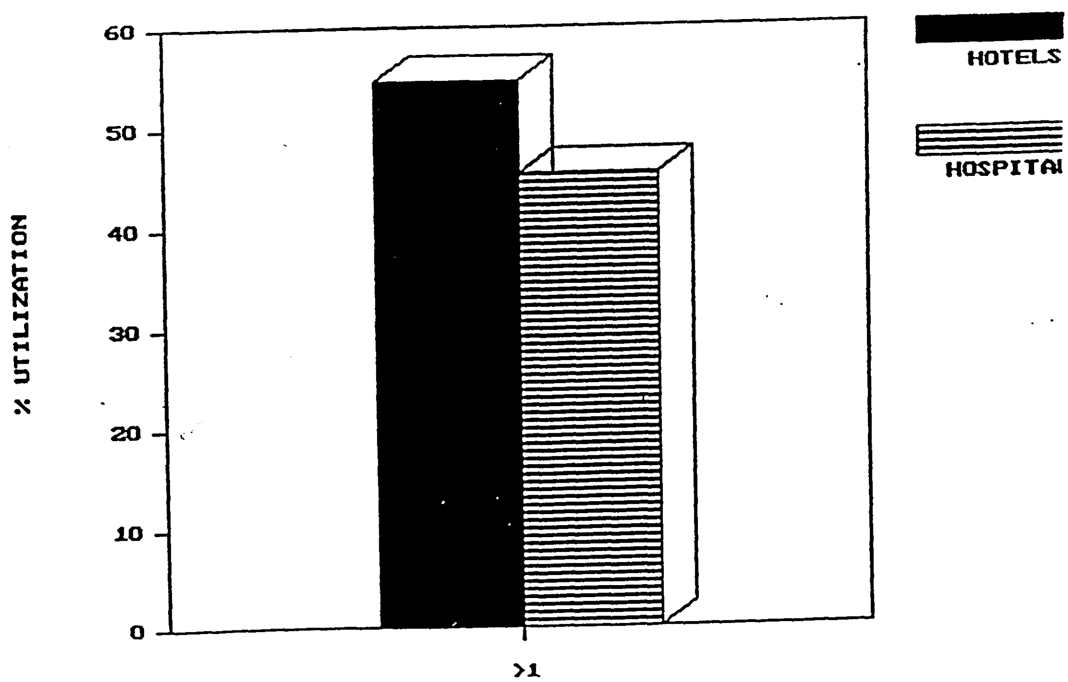


Figure 2 - ONE OR MORE OVENS

TABLE 3 - COMBI OVENS

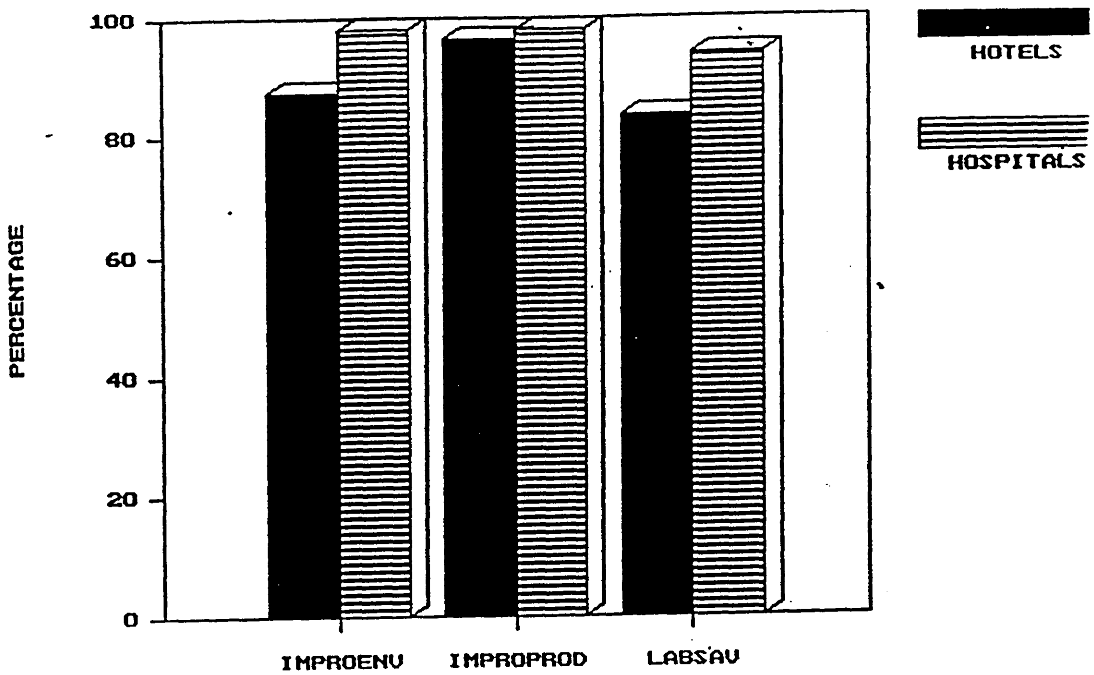


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

CONVENTIONAL FRYERS

Figure 5.1 Row 4 (Source Table 4)

Overall utilisation

At the time of the survey, 90% of hotels and 80% of hospitals use conventional fryers along with other types of catering equipment; they are seen as essential components in most kitchens. Their established role is producing chips and other deep-fried items, despite the attention given to healthy eating. Their future is safeguarded by the progressive attitude of fryer manufacturers in bringing this equipment up-to-date with new technology, for example providing secondary high limit thermostats which cut off the fuel supply if the main control thermostat fails.

Reasons for utilisation

1. Improve environment

The survey shows that only 33% of hotels, 10% of hospitals state that the conventional fryer improves the environment. This is a low percentage return, and confirms that no caterer would put the fryer into the top league for improving the environment; even with good extraction within the kitchen, the steam and aromas of fried food continue to linger and impregnate the atmosphere long after the frying has finished. In many instances, the smell of fried food, particularly old or burnt fat, deters potential customers from entering restaurants.

2. Improve productivity

53% of hotels, 27% of hospitals in the survey assess this fryer as improving productivity. The conventional fryer is operated by gas or electricity, either with heating elements or direct heat to the tank. The main drawback to productivity is that particles of food remain in the fat and burn, causing the bitter smell that permeates the air, and discolours the fat, thus adversely affecting the taste of the fried food. The food produced, therefore, is not of a consistently high standard. The main advantage of all fryers (although these vary in efficiency) is the speed of cooking and colouring food, essential for batch cooking, especially in institutional catering. Within hotels, the conventional fryer is quicker for frying game chips or straw potatoes used for garnishes than the chip-pan placed on the stove, and with the latter apparatus there is also a higher risk of fire.

3. Labour saving

According to the survey only 42% of hotels, 25% of hospitals see the conventional fryer as labour saving. Although deep-fat frying is a fast method of cooking, kitchen staff do not like using the apparatus, as the smell of fat lingers on the skin and clothes. As a machine, the fryer needs to be cleaned thoroughly and again this is a safety hazard, either from fat spillage or operatives being burnt. Although the British public relish their fish and chips, kitchen staff do not enjoy the tasks that are associated with this cooking method, as it is time-consuming and laborious to stand in front of a deep-fat fryer batch cooking fish or blanching chips, and assessing the "doneness" of the item by its colour.

TABLE 4 - CONVENTIONAL FRYERS - Comparitive Utilization

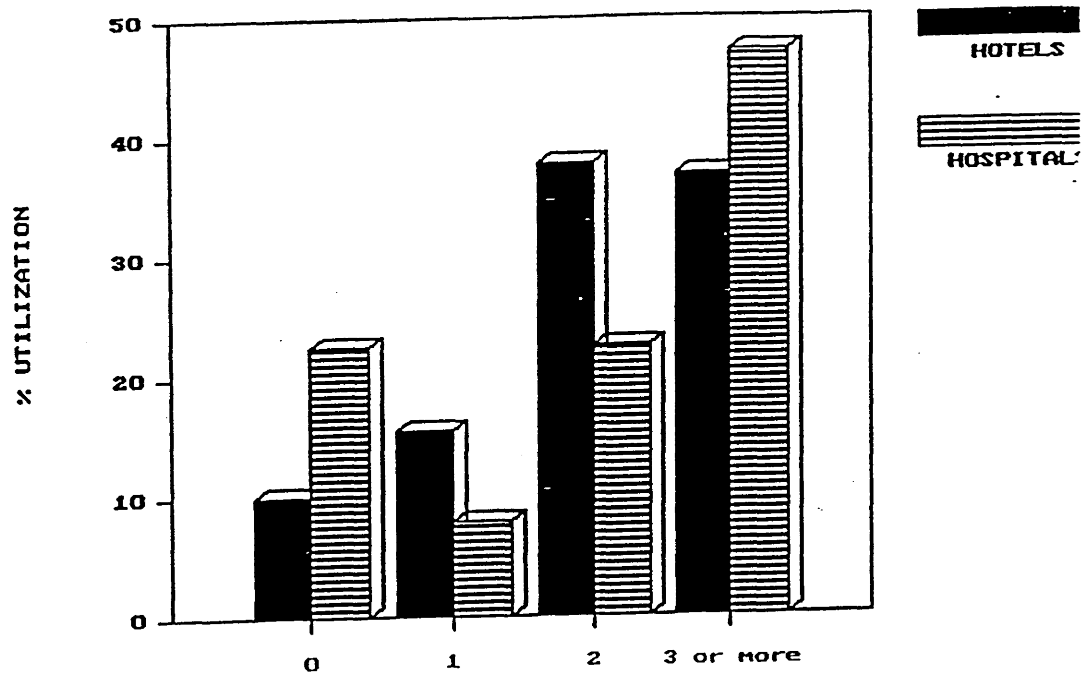


Figure 1 - NO OF CONV. FRYERS

TABLE 4 - CONVENTIONAL FRYERS - % Utilizing one or more

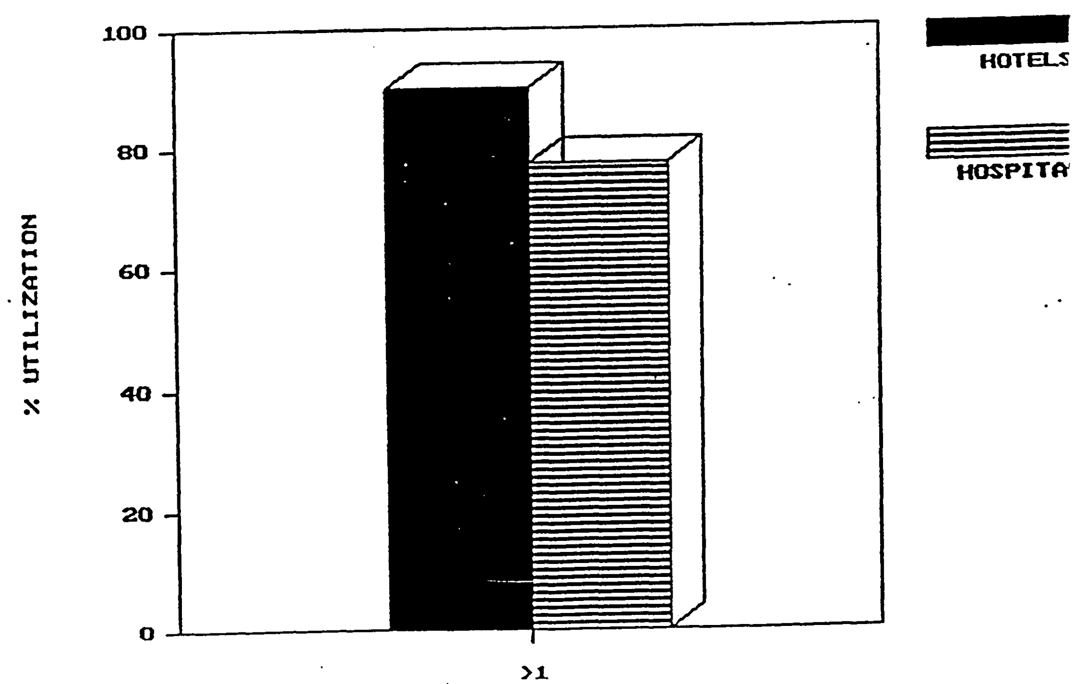


Figure 2 - ONE OR MORE CONVENT

TABLE 4 - CONVENTIONAL FRYERS

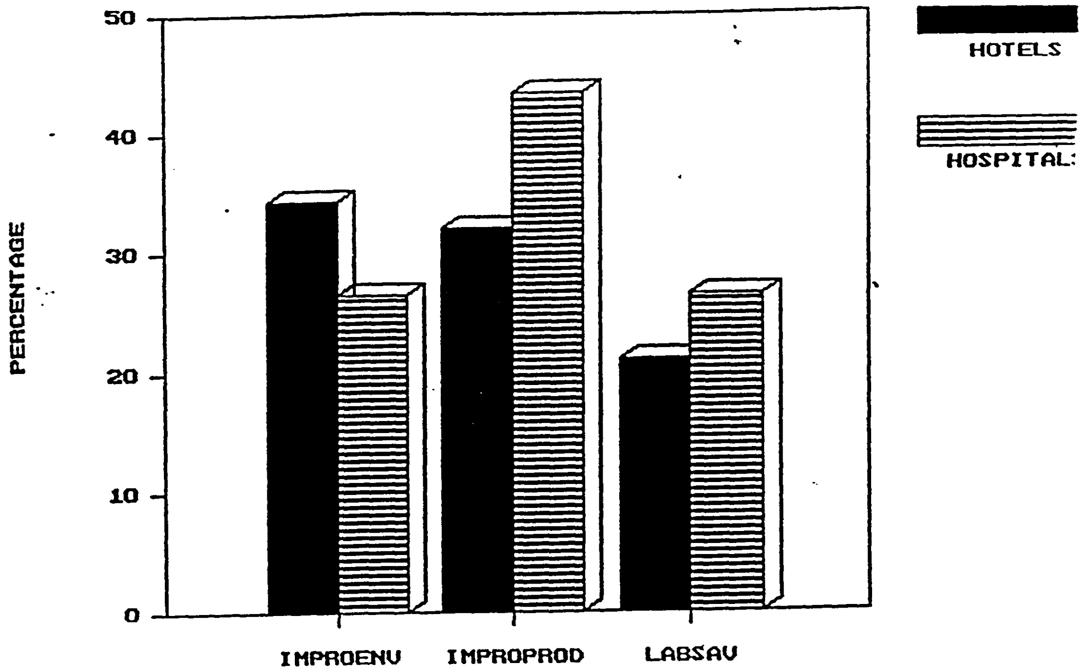


Figure 3

<u>KEY</u>

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

COOL ZONED FRYERS

Figure 5.1 Row 5 (Source Table 5)

Overall utilisation

At the time of the survey, 12% of hotels, 25% of hospitals use cool zoned fryers in their food production process. This model of deep-fat fryer has been developed with a cool zone below the heating element, the advantage being that the oil is cooler in this zone where particles of food can accumulate, (such as breadcrumbs or batter); this prevents the burning of small items of food, makes them easier to remove and prolongs the life of the oil. Modern fryers need high levels of heat input, to ensure that the heat recovery of the oil is as fast as possible. If the fat temperature remains low, the food will absorb too much oil and take longer to cook. When the debris drops to the cool zone below the heating element, heat recovery in the cooking zone is more rapid. This is a particular advantage in modern catering, when many deep-fried items are cooked from a frozen state, and speedy heat recovery is essential.

Reasons or utilisation

1. Improve environment

The survey shows that 72% of hotels, 76% of hospitals report an improvement in the working environment; less steam is generated with this model, resulting in a decrease in the aroma of fried food, which tends to cling to clothes and body, to the discomfort of both staff and consumer. This increases the staff's acceptance of deep-fat frying. The main advantage in the cool-zoned fryer is the V-shaped base, allowing for the easier removal of the oil for filtering and replacement (no corners to complicate this task); this also increases the life of the frying oil and improves the working environment with diminished pungent smells.

Safety is an important factor in fryer design, as this equipment is the greatest source of fire and injury in most kitchens. The majority of fryers do not have an automatic device to cut off the fuel supply if the main control fails. (Whitehall, 1990).

2. <u>Improve productivity</u>

82% of hotels, 92% of hospitals in the survey endorse improved productivity, as better control of the fat temperature and less likelihood of burning the food enables the staff to produce food more acceptable to the customer and to themselves.

3. <u>Labour saving</u>

64% of hotels, 52% of hospitals report the cool zoned fryer to be labour saving. It is viewed as an improvement on the conventional fryer, mainly owing to the more efficient temperature control and the rapidity of the fat re-heating. No chef likes to cook with an underpowered fryer in a busy kitchen; putting a large batch of food into a fryer slows the whole cooking process down and increases the sogginess of the food, and customer dissatisfaction. Despite trends towards healthy eating, fried food has not lost its popularity with the public.

TABLE 5 - COOLZONED FRYERS - Comparitive Utilization

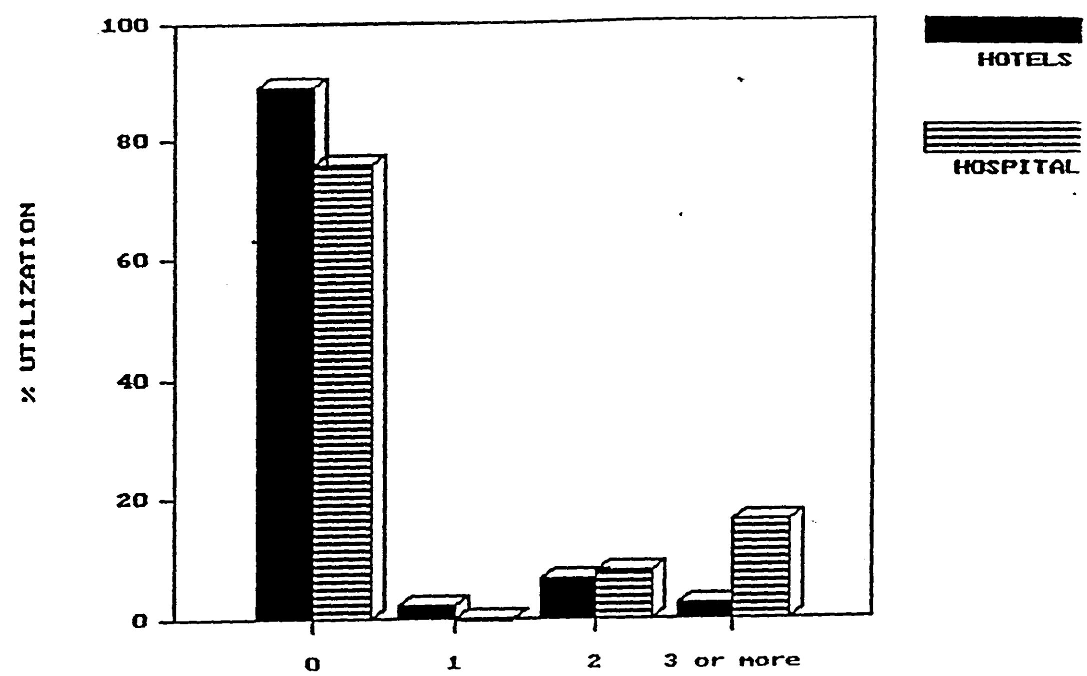


Figure 1 - NO OF COOLZ. FRYERS

TABLE 5 - COOLZONED FRYERS - % Utilizing one or more

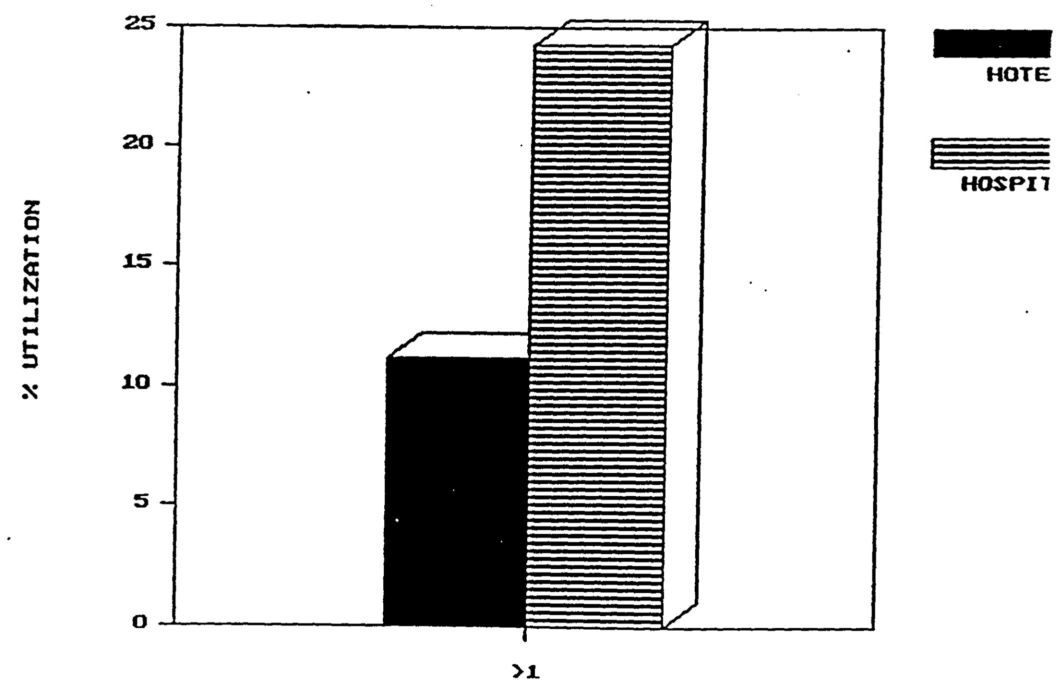


Figure 2 - ONE OR MORE COOLZON

TABLE 5 - COOLZONED FRYERS

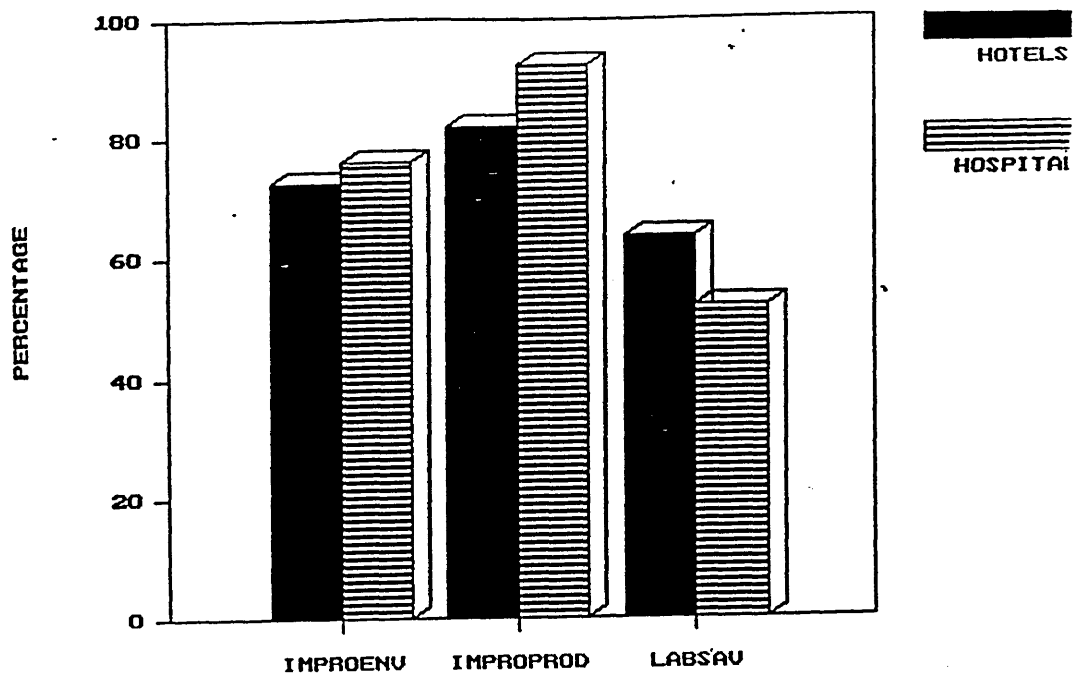


Figure 3

KEY

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

COMPUTERISED FRYERS

Figure 5.1 Row 6 (Source Table 6)

Overall utilisation

At the time of the survey, only 5% of hotels were using computerised fryers. These fryers can greatly aid safe operation, but their main justification is in quality control. Unlike pre-set timers, computer controls react to the food/oil ratio and the rate of change in the oil temperature. From this, the computer can calculate the exact frying time (Whitehall 1990). When the food is cooked, the computer signals the user to remove the basket, or there is an automatic lift system. The present price is £800-£1000 per unit, which is too expensive for the majority of caterers.

Reasons for utilisation

1. Improve environment

An improved environment is reported by 70% of hotels, in the survey. Although currently in limited use, the computerised fryer has already made an impact on the catering environment, primarily in the reduction of heat and steam generated into the atmosphere; they are also cleaner and have better temperature control than conventional fryers.

2. Improve productivity

90% of hotels in the survey state that the computerised fryer improves productivity. With this model there is certainty that the foods are correctly cooked. This benefits the caterer, secure in the knowledge that the food is therefore safe for the customer to eat. Because there is less margin for error, more correctly-cooked food can be produced more efficiently, increasing productivity.

3. <u>Labour saving</u>

90% of hotels in the survey view this apparatus as labour saving. The main advantage is the increased output of food with the more powerful burners. In addition, the basket lift system allows the staff to get on with other jobs while the food is frying.

TABLE 6 - COMPUTERIZED FRYERS - Comparitive Utilization

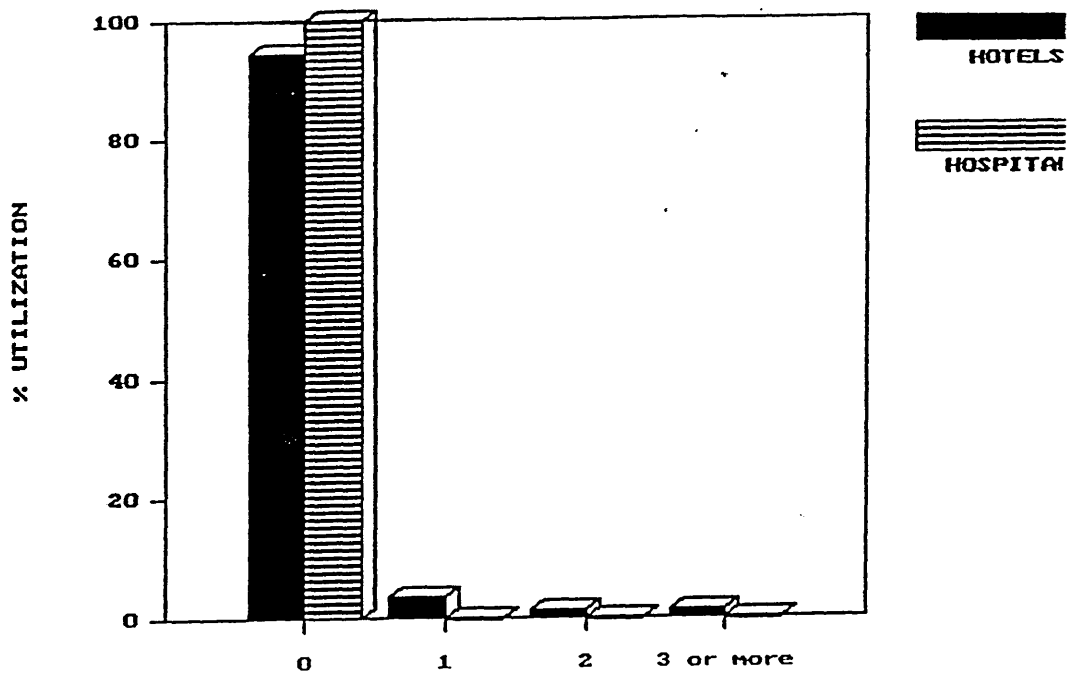


Figure 1 - NO OF COMP. FRYERS

TABLE 6 - COMPUTERIZED FRYERS - % Utilizing one or more

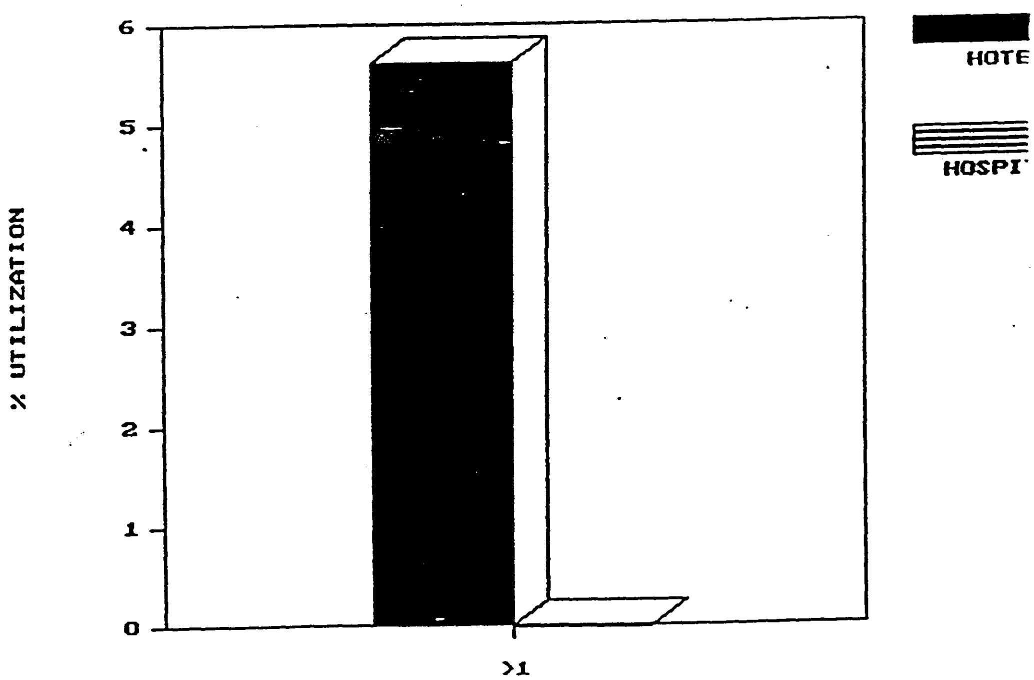


Figure 2 - ONE OR MORE COMPUTE

TABLE 6 - COMPUTERIZED FRYERS

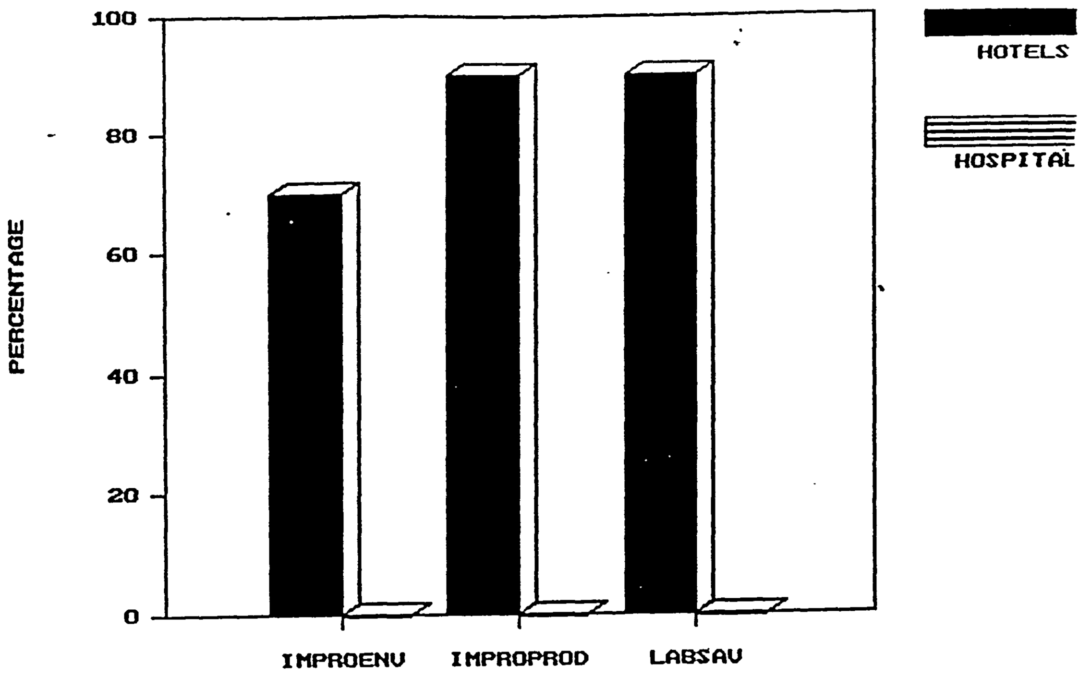


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

COMBINATION MICROWAVES

Figure 5.1 Row 7 (Source Table 7)

Overall utilisation

At the time of the survey, this piece of catering equipment is still new and not used by the majority of the Hotel & Catering Industry, (20% of hotels, 6% of hospitals). This may reflect lack of resources or lack of knowledge of the combination microwave. It is more versatile than the ordinary microwave, as it can brown and cook the food simultaneously. With the advantage of programming the microwave, many cooking processes can be achieved, from scrambled egg to apple pie.

Like the ordinary microwave, this machine is limited to a small throughput of food, but with the added capability of browning food (as in pastry cooking or a roast appearance) it will be an essential item of catering equipment.

Reasons for Utilisation

1. Improve environment

The survey shows figures of 77% of hotels, 67% of hospitals reporting an improvement. It would seem that the main improvement to the environment is the speed of cooking, which reduces the level of fuel consumption and therefore the heat transfer to the kitchen humidity, for example a soufflé would cook in approx. 5 minutes but take 20 minutes in an ordinary oven. This not only reduces the heat in the environment, but also reduces the stress element for the staff, who can more easily guarantee the microwaved product than that produced in a conventional oven, where other variables need to be considered, such as correct temperature control, and other items of food being cooked at the same time.

2. Improve productivity

The survey shows that 73% of hotels, 67% of hospitals state that the combination microwave offers an all-round cooking improvement as the food can be browned and cooked quickly. This also aids the speed of service to the customer and increases the speed of trade turnover.

3. Labour saving

According to the survey, 69% of hotels, 67% of hospitals have assessed this as labour saving. Less time is required by the catering staff in food production, as this machine can cook and brown items of food ready for consumption, unlike the ordinary microwave, which cooks the product which then has to be browned either under the grill or in the oven; this prolongs the cooking time and requires increased staff energy in movement, in order to achieve the correct presentation. At the present time, tunnel microwave ovens are used for institutional and banquet service, to enhance speed of service; these could eventually be incorporated into cook-chill service in place of regeneration ovens. (Restaurants & Institutions, April 1990).

TABLE 7 - COMBINATION MICROWAVES - Comparitive Utilization

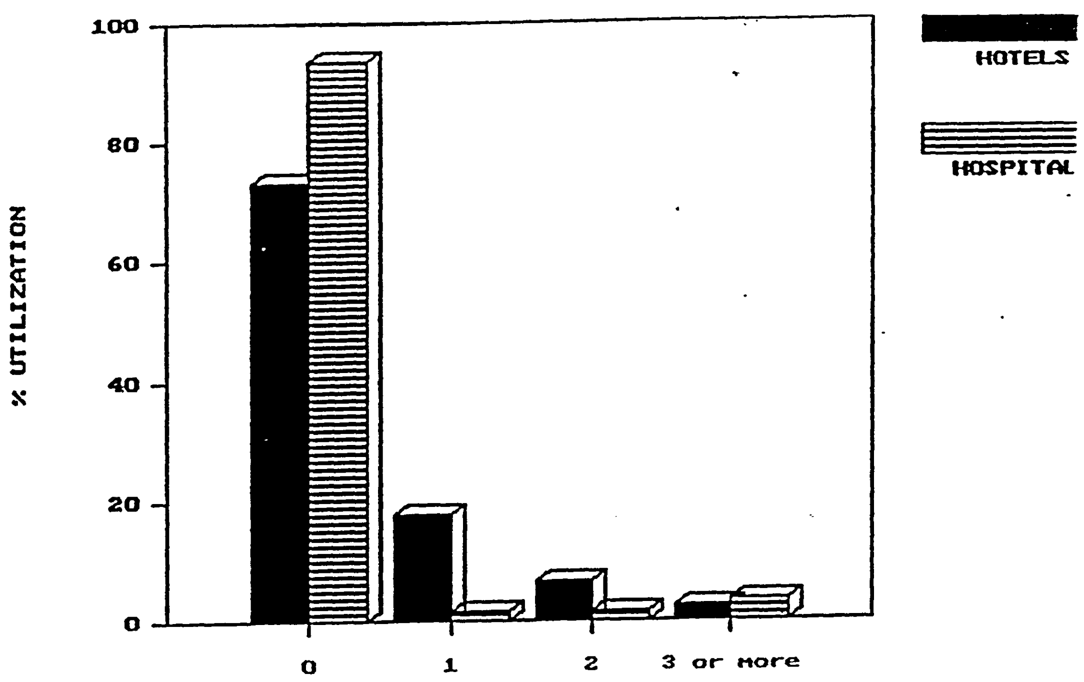


Figure 1 - NO OF COMBI. MICROS

TABLE 7 - COMBINATION MICROWAVES - % Utilizing one or more

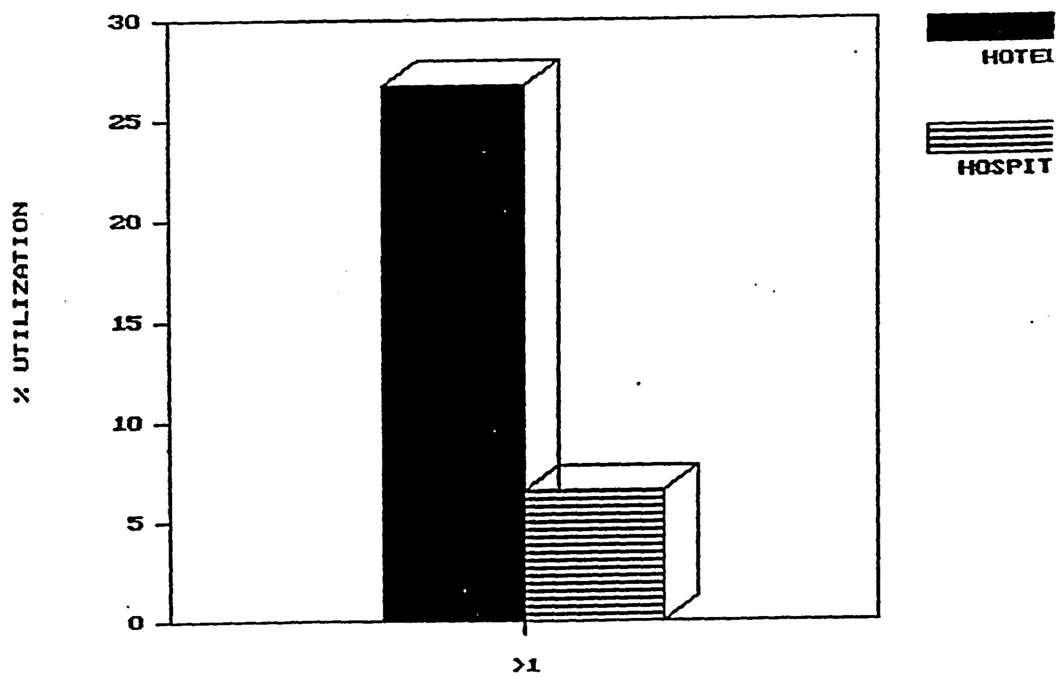


Figure 2 - ONE OR MORE COMBI.

TABLE 7 - COMBINATION MICROWAVES

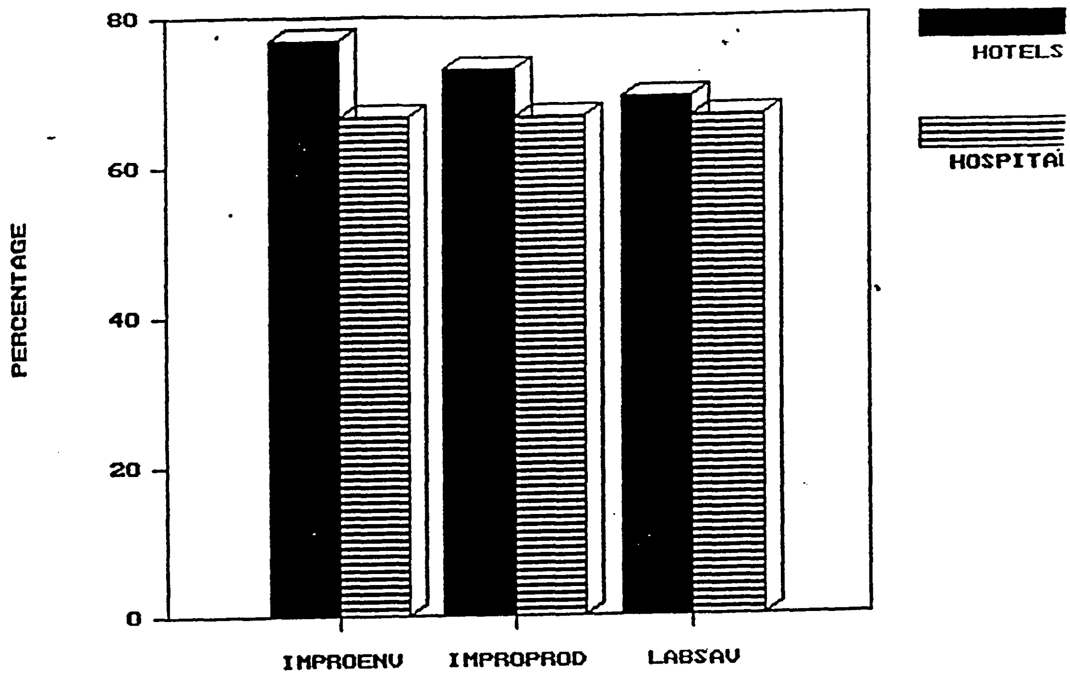


Figure 3

KEY

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

ORDINARY MICROWAVES

Figure 5.1 Row 8 (Source Table 8)

Overall Utilisation

At the time of the survey, 80% of hotels and 75% of hospitals produce food with the use of an ordinary microwave. This piece of catering equipment has been in operation for more than twenty years, and is versatile and efficient, but the majority of caterers use it only as a back-up to traditional cooking, for thawing or reheating food, not as a complete cooking process on its own. One reason for this is that this apparatus cooks but does not colour food for presentation purposes, although it is excellent for reheating food from cold (for example a burger bun to 70°C in 20 seconds).

The catering industry use ordinary microwaves in excess of one per unit, as the apparatus is small in capacity in both wattage (average 600 watts) and plate capacity (average throughput 5 plates per 15 minutes). The biggest commercial size at the present time is 1,400 watts, used by Burger King (Restaurants & Institutions, April 1990).

It would seem from the survey that, despite its limited application, the microwave is a permanent feature of a hotel and catering establishment, although ordinary microwaves will tend to be superseded by combination microwaves, with their greater versatility.

Reasons for Utilisation

1. Improve Environment

The survey shows that 59% of hotels and 65% of hospitals state that as an apparatus the ordinary microwave produces little external heat, unlike an ordinary oven; it also takes up little space and can be fitted into most recesses, or on to shelves, as long as it is at eye level, to prevent spillage on to the user.

2. Improve productivity

The survey show 55% of hotels and 52% of hospitals classify the ordinary microwave as beneficial to productivity, mainly as a back-up to food production, either to reheat food for a late customer or within a finishing kitchen or coffee shop for general service of the completed dish. Used in this way, instant hot food is provided for the customer, at a constant temperature of 68°C.

A possible disadvantage of the ordinary microwave would be the nature of the initial cooking process, where the food molecules are agitated, causing heat-producing friction; the waves do not generally pass more than 2 inches into the food, the outer areas heating first; this has a limiting effect on the type of food the caterer can cook within the microwave, for example, individual portions of chicken are more suitable than the whole bird.

3. Labour saving

According to the survey, 55% of hotels, 51% of hospitals classify the ordinary microwave as labour saving. It saves on fuel consumption, and if the equipment is located correctly near the hotplate it is accessible for both the kitchen and restaurant staff to cook or reheat food quickly for the customer. If a bank of microwaves is incorporated into the servery area, this reduces the need for bulky hot-holding equipment, which is limited in its use. The microwave also saves on fuel consumption, as it is operated only when required, unlike the hot plate, which needs to be heated and maintained at a high temperature throughout the service period.

TABLE 8 - ORDINARY MICROWAVES - Comparitive Utilization

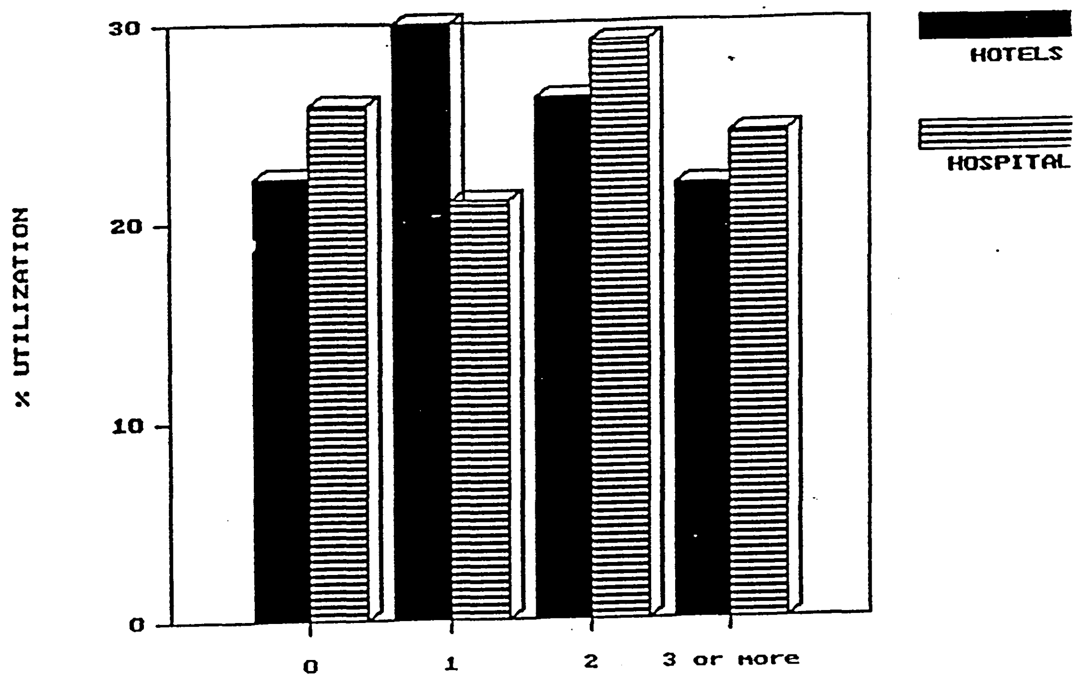


Figure 1 - NO OF ORDIN. MICROS

TABLE 8 - ORDINARY MICROWAVES - % Utilizing one or more

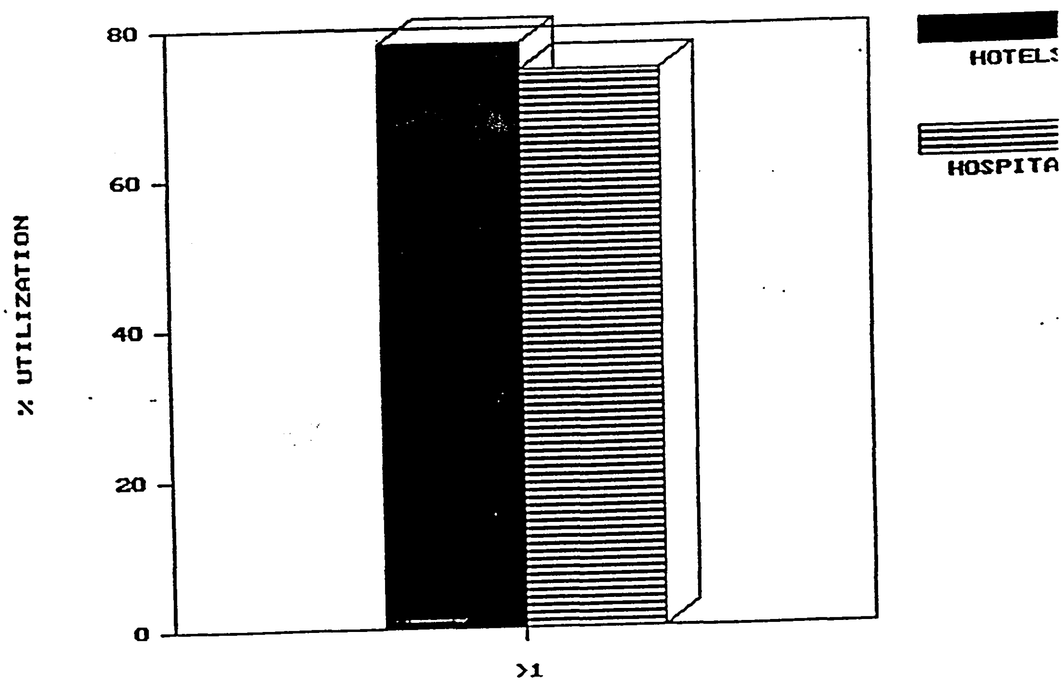


Figure 2 - ONE OR MORE ORDINAR

TABLE 8 - ORDINARY MICROWAVES

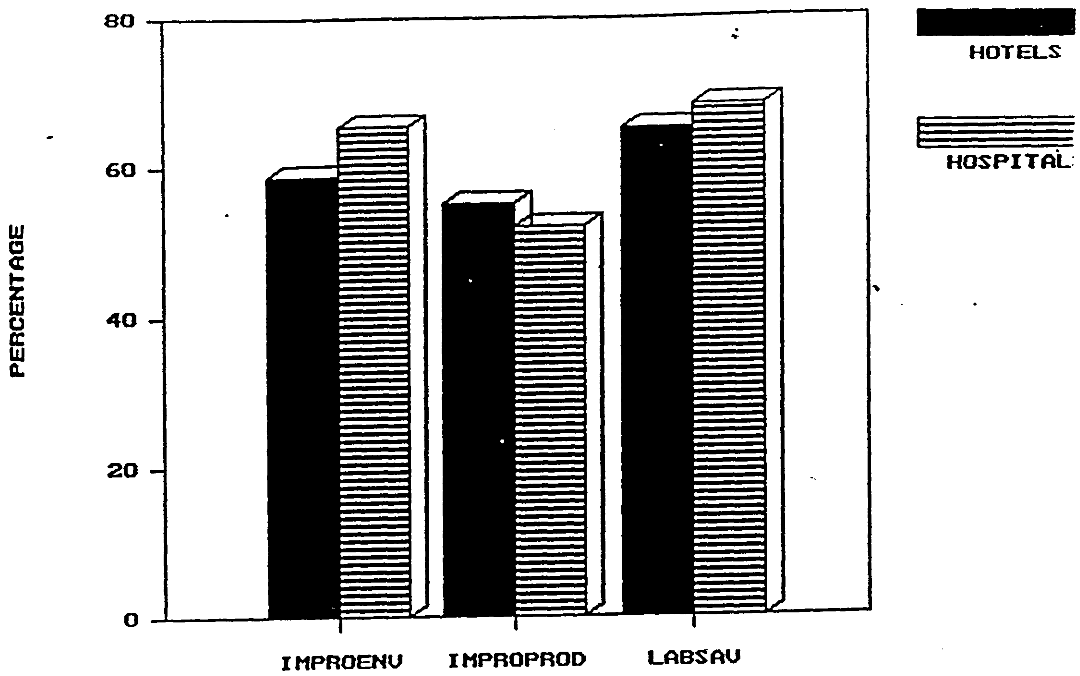


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

PRESSURE STEAMERS

Figure 5.1 Row 9 (Source Table 9)

Overall Utilisation

At the time of the survey, 46% of hotels, 70% of hospitals produce food with the use of a pressurised steamer. The survey shows a high differential between the two kinds of organisation; possibly, this method of cooking is more suitable to bulk catering, hence the bigger percentage within hospitals, with their limited choice and bulk production menu. Pressure steamers range from small counter models suitable for 100 meals to larger 2-3 compartment models, capable of batch cooking. Cooking in a pressure steamer allows for steaming at a higher temperature, which means the food is cooked in a shorter time and retains more flavour, colour and nutritional value, ideal for hospital catering. These benefits are important to hotels too, but they also seek eye appeal and greater aesthetic value for customers, achieved through individual cooking as in à la carte menus or flambe work.

Reasons for utilisation

1. Improve environment

The survey shows that 63% of hotels, 67% of hospitals agree that the mechanism of the pressurised steamer, which can generate the steam internally within the cooking vessel, alleviates the problem of a poor working environment, by discharging the steam into the drainage system rather than into the atmosphere, unlike conventional steamers.

2. Improve productivity

According to the survey, 87% of hotels, 77% of hospitals endorse an improved productivity. The main advantage of the pressure steamer is that it allows large volumes of food to be batch cooked in small quantities, which improves quality and solves the problem of hot-holding food for a long time during the food service period. One difficulty when using pressure steamers is that it is impossible to check when the food is ready because of the safety interlocks; on account of this, the chef has to switch off, de-pressurise the compartment and then, after inspection, switch on again, and make a time adjustment (unlike the pressureless steamer, where it is possible to open and close the door at any time).

3. Labour saving

82% of hotels, 67% of hospitals in the survey state that pressure steamers cook the food very quickly, unlike the boiling method traditionally found within hotel/hospital catering. For this reason, the user has to be aware that timing must be precise, otherwise food wastage could occur with overcooking. (This problem was reported within the hospitals visited, as the machines lacked automatic timers.)

TABLE 9 - PRESSURE STEAMERS - Comparitive Utilization

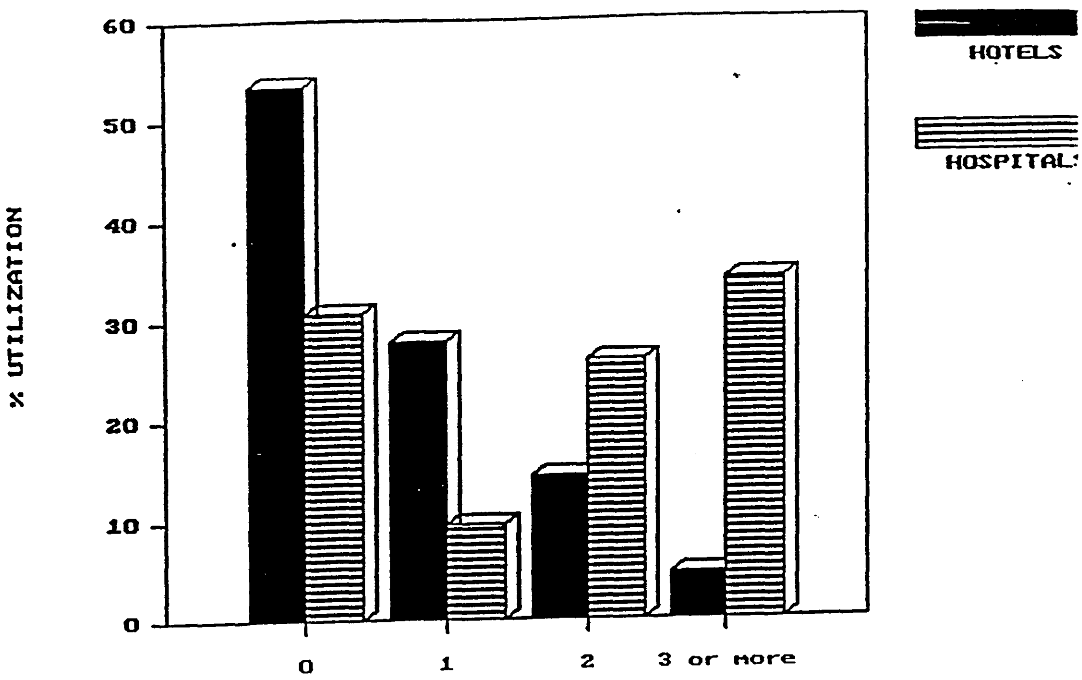


Figure 1 - NO OF PRESSURE STEA

TABLE 9 - PRESSURE STEAMERS - % Utilizing one or more

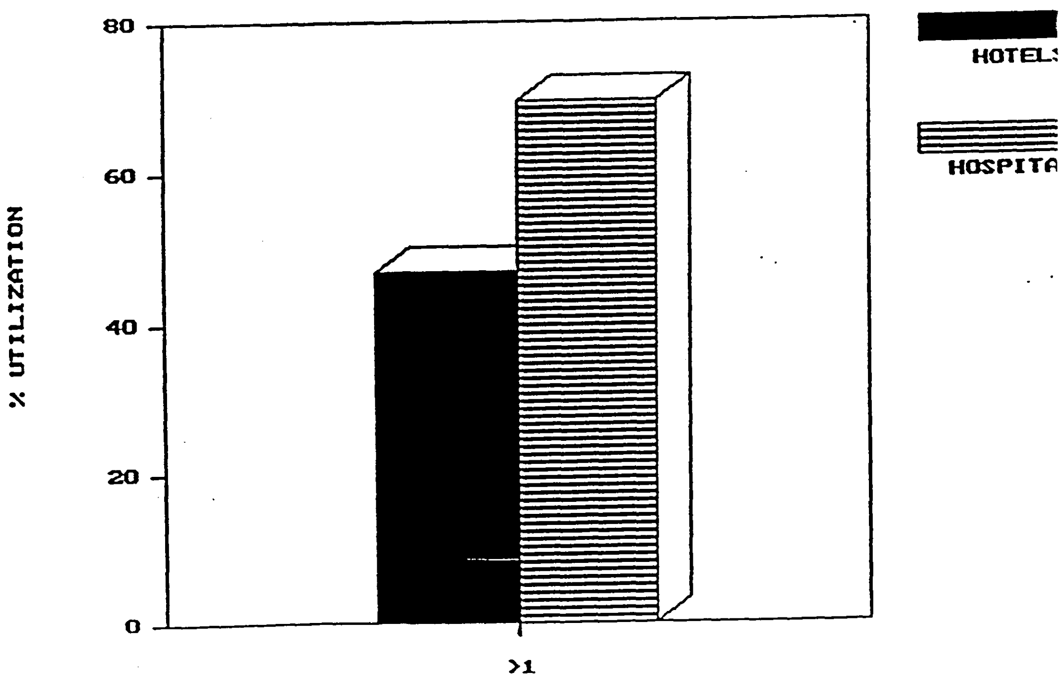


Figure 2 - ONE OR MORE STEAMER

TABLE 9 - PRESSURE STEAMERS

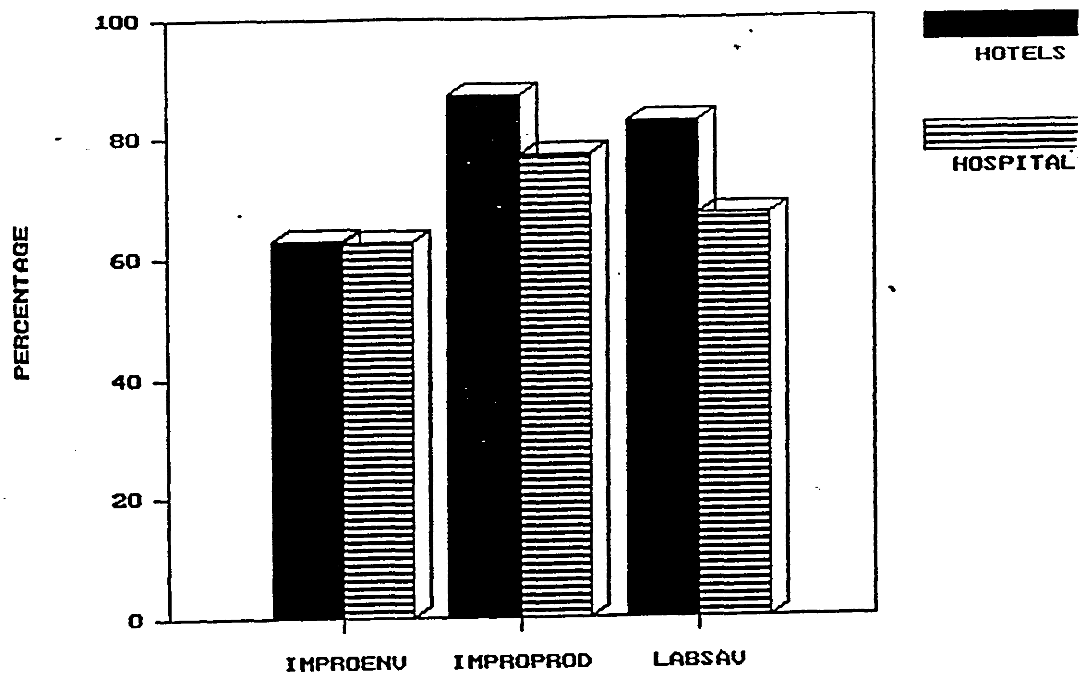


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

CONVENTIONAL STEAMERS

Figure 5.1 Row 10 (Source Table 10)

Overall utilisation

The research shows that 42% of hotels, 58% of hospitals make use of conventional atmospheric steamers. In these, the food is surrounded by static steam, which is generated from a heated water bath in the base of the unit, which is replenished either manually or automatically.

The rate of steam is controlled by a thermostat. These steamers are ideal for cooking medium to large sized quantities of slow cooking items, such as whole gammons or steamed puddings.

Reasons for utilisation

1. Improve environment

The survey shows that 52% of hotels, 9% of hospitals report an improved environment, a wide differential between the two. The hotels visited use fairly modern steamers which have better thermostatic controls and automatic water fill. In hospitals where the steamers are old, and leak water, steam is generated profusely, filling and stifling the atmosphere with different aromas of food, thus adversely affecting the environment.

2. Improve productivity

According to the survey, 61% of hotels, 27% of hospitals report an improvement in productivity. Hotels are assessing productivity on limited menu use, for example steam puddings, where the failure rate is minimal. Within hospitals, the bulk of the production menu can be cooked in the steamer and on many occasions the quality of steam generated to accomplish the day's menu can be jeopardised by a steam failure in the boiler room, or too much water being used on the wards. It is a catastrophe for the chef if this breakdown occurs during the process of steaming joints of meat or 100 cwt. of potatoes.

3. Labour saving

The survey shows that 64% of hotels, 21% of hospitals view this item of equipment as labour saving. Traditional catering within hospitals takes conventional steamers for granted. The hotel chef sees the apparatus as a machine that cooks food slowly, but times precisely, leaving him/her free to continue with other cooking tasks that need short cooking time or continuous attention, such as fillet of sole meuniere.

TABLE 10 - CONVENTIONAL STEAMERS - Comparitive Utilization

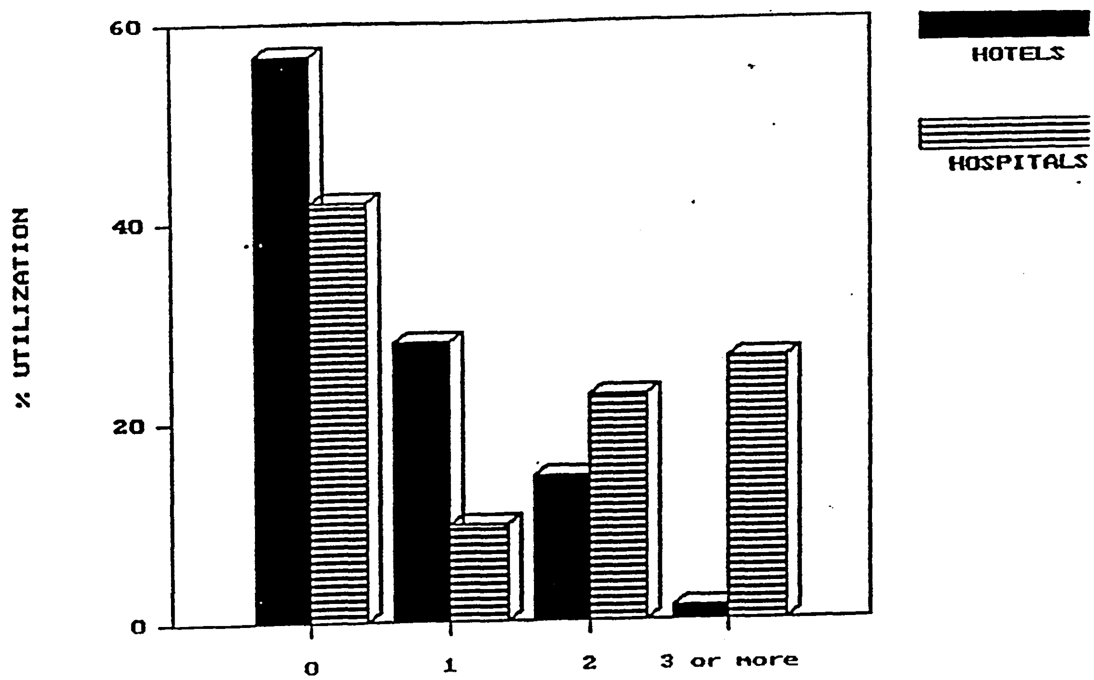


Figure 1 - NO OF CONV. STEAMS

TABLE 10 - CONVENTIONAL STEAMERS - % Utilizing one or more

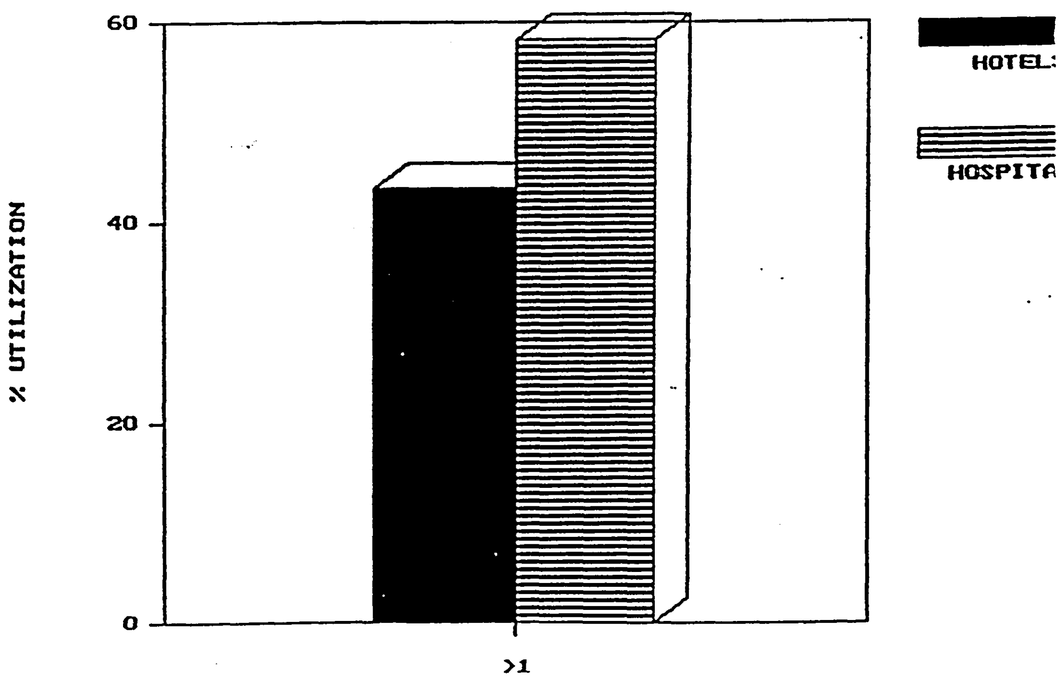


Figure 2 - ONE OR MORE STEAMER

TABLE 10 - CONVENTIONAL STEAMERS

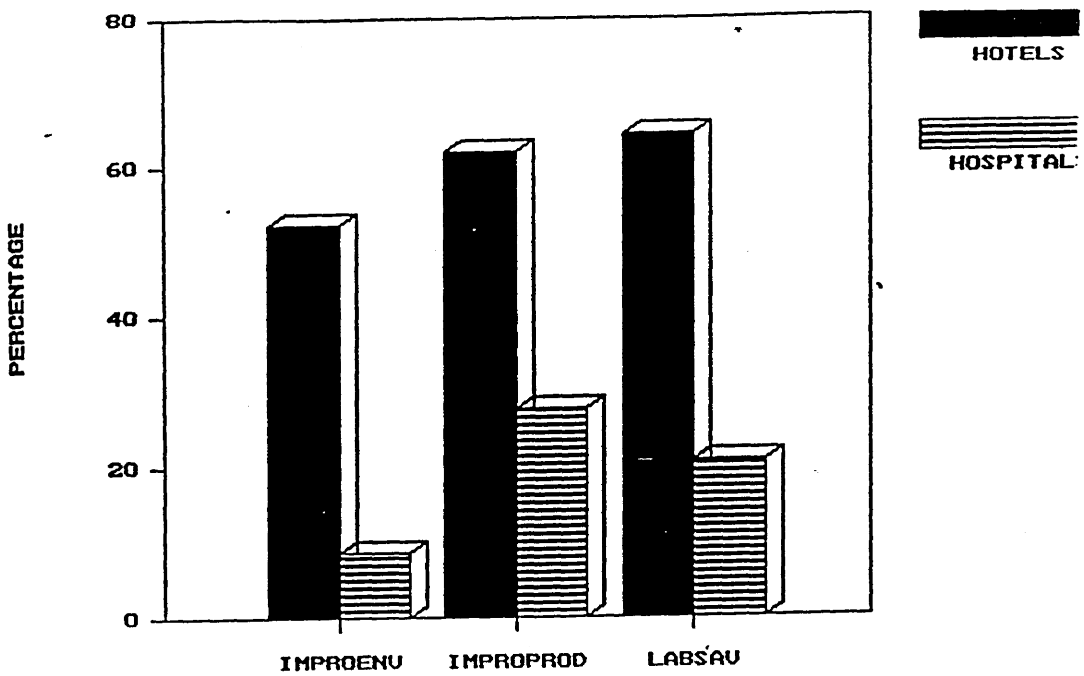


Figure 3

<u>KEY</u>

IMPROENV - **Improve environment**

IMPROPROD - **Improve productivity**

LABSAV - **Labour saving**

Figure 5.1 Row 11 (Source Table 11)

Overall utilisation

At the time of the survey, 68% of hotels and 83% of hospitals produce food with the use of a bratt pan, demonstrating the value of this item of equipment, especially by the institutional sector. Possibly, in the past it may have been viewed as an oversize saucepan, without full appreciation of its capabilities for a wide variety of cooking methods, for example frying, braising, poaching, stewing and boiling. it can heat up to 300°C, unlike boiling pans, with which it is sometimes confused (possibly owing to its similarity within companies' brochures). The bratt pan has been associated with large-scale cooking (180 litres) but now smaller models (25 litres) are available to fit into smaller kitchens. Response to this survey showed that hospitals make more use of the versatility of the bratt pan than do hotels, generally because of the larger quantities of food produced. With the varying sizes of bratt pans now available, this differential may change in the future.

Because of its versatility, many catering units use more than one bratt pan, especially large-scale catering, such as cook-chill. As various cooking methods can be implemented the bratt pan can dispense with the conventional gas solid-top, and the assortment of saucepans. It has other economies to offer, in that it is easy to clean, thermostatically controlled and many models use a heat-intensity switch to prevent burning.

Reasons for utilisation

1. Improve environment

This survey shows that 53% of hotels and 54% of hospitals state that the bratt pan improves the environment, but this item of equipment is not necessarily totally beneficial for the kitchen environment, as it produces intense heat at times; although the bratt pan is fitted with a lid, any steam generated is incorporated into the kitchen humidity, so it needs to be placed near an extraction canopy. But this inconvenience is better for the kitchen environment than large numbers of saucepans on top of a stove.

2. Improve productivity

The survey shows that 81% of hotels and 76% of hospitals state that the bratt pan improves productivity. As the bratt pan can be used to braise items or to make sauces, it is an invaluable asset to the chef, and energy-saving for the caterer (Thompson, 1987). A complete cooking process, such as braising, can be accomplished in the bratt pan, from the initial sealing of the meat, to making the roux and the final sauce, without using different utensils, as in the conventional manner.

3. Labour saving

The survey shows that 79% of hotels and 90% of hospitals consider the bratt pan to be labour-saving. This response is the highest on the bar chart, as hospitals would use 3-4 bratt pans, where hotels would generally make use of one. This represents the views of the user who, with many tasks to perform in meal production, appreciates the versatility of the bratt pan, which is being used across the wide spectrum of catering. It is certainly easy to manage and control, and with its tilting mechanism, safe to handle. Push button controls can be operated by the foot or knee, leaving the chef's hands free to deal with the food; with the smaller models, handles are used for tilting the bratt pan.

Hotels report a high usage, but use the bratt pan for cooking or browning food such as steaks or duck à la l'orange, mainly for banquets or function catering for large numbers, not for à la carte cuisine; hospitals, however, use the bratt pan for every meal from breakfast, lunch and dinner, for cooking sausages, liver and onions to beef olives, in large numbers.

TABLE 11 - BRATT PANS - Comparitive Utilization

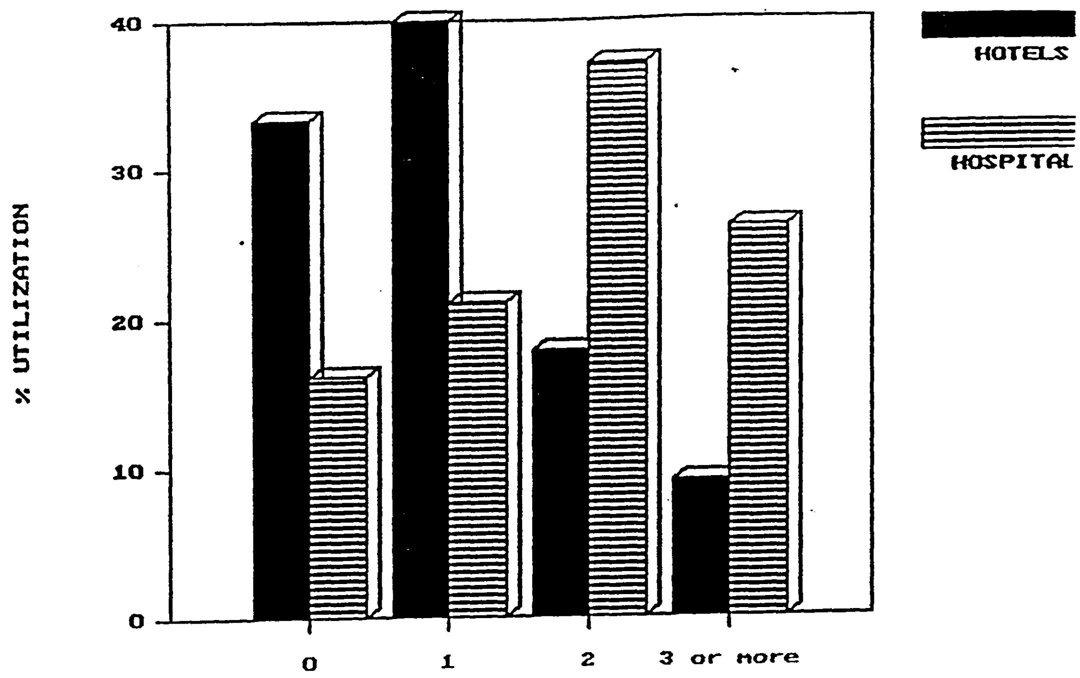


Figure 1 - NO OF BRATT PANS

TABLE 11 - BRATT PANS - % Utilizing one or more

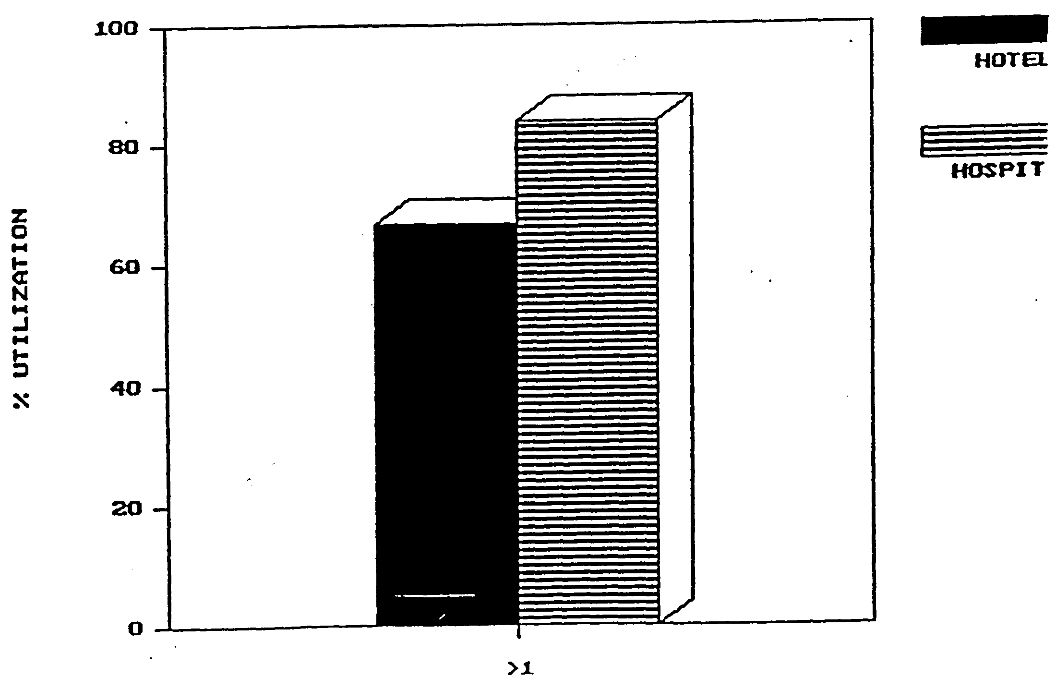


Figure 2 - ONE OR MORE BRATT P

TABLE 11 - BRATT PANS

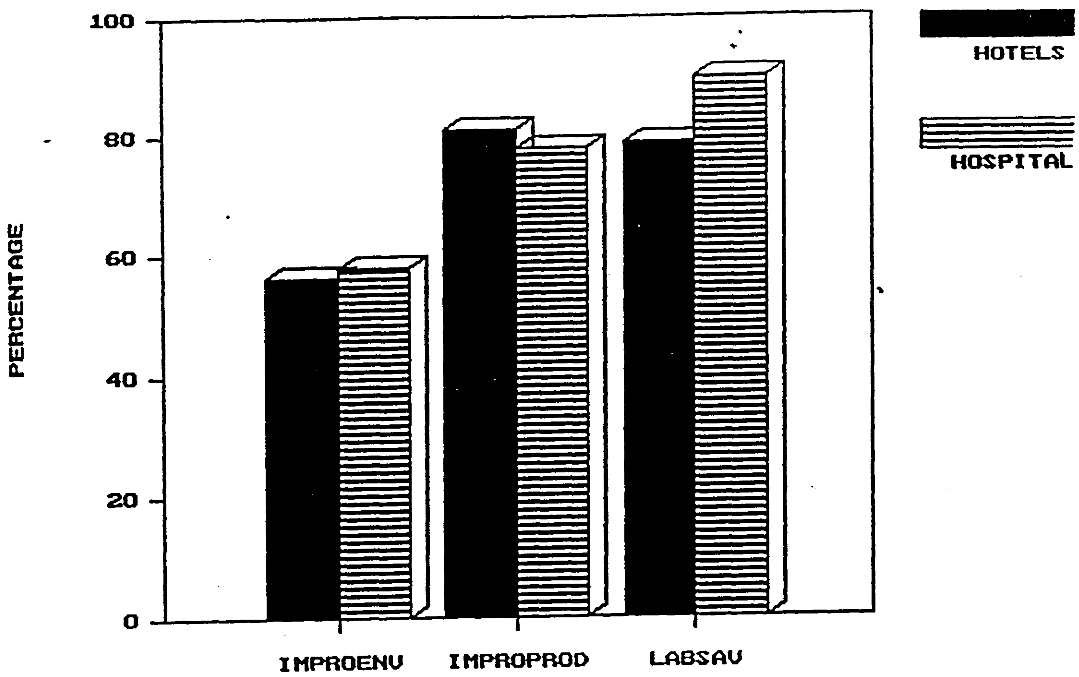


Figure 3

KEY

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

BOILING KETTLES

Figure 5.1 Row 12 (Source Table 12)

Overall Utilisation

The differential in utilisation between hotels (39%) and hospitals (80%) has various explanations. Hotels, because of the à la carte menus, mainly use solid tops and ovens for their individual poached or roast items and the many varieties of sauces produced. The boiling kettle is mostly used for producing the fresh stocks essential for a good sauce and soup. The kettle may also be used to cook vegetables, although these are being cooked increasingly today in pressureless steamers or combi ovens. Within hospitals, steam is one of the most efficient forms of cooking energy, generating six times the heat of boiling water and this is provided in abundance from the central heating systems within hospitals. Boiling kettles transfer heat to food more effectively than a pot on top of a range, which only heats the base. Steam injected into full-jacketed kettles heats the sides as well as the bottom. Wide, shallow kettles are used for simmering and braising meats, while tall, deep kettles keep stews, soups, casseroles and other more fluid foods from splashing around during stirring or movement. All the above are to be found within bulk catering, especially hospital catering.

Reasons for utilisation

1. Improve environment

The survey shows that 58% of hotels but only 36% of hospitals state that the boiling kettle improves the environment. Hotels, possibly because of their limited use of the boiling kettle, may not associate this item with the disadvantage of the vast amount of steam that is generated from this piece of equipment. In hospital catering, on the other hand, there may be six - ten boiling kettles simultaneously generating large amounts of steam which causes condensation, and can be a safety hazard, causing wet floors, where staff may slip. Although the kettle radiates little direct heat, there is the risk of steam burns.

2. Improve productivity

From the survey, 71% of hotels, 61% of hospitals view the kettle as an aid to productivity. Food can be cooked quickly in a boiling kettle, and a fresh food appearance is maintained if the equipment is used correctly, (for example for cooking vegetables). The kettle is used for various food items, but primarily associated with large quantities of liquids, such as stews or milk puddings. Within hospital catering, boiling kettles are so highly utilised that they are taken for granted and given insufficient credence.

3. Labour saving.

64% of hotels, 51% of hospitals in the survey endorse this apparatus as labour saving. Here, level of utilisation is important. Hotels (which report low utilisation) consider the boiling kettle beneficial for stock-making, which would be cumbersome in saucepans on top of stoves; hospitals (which report high utilisation) associate the boiling kettle with heavy lifting of foods in or out; as some kettles can hold 40 gallons of water, and therefore have a large capacity for joints of meat or vegetables, the amount of heavy lifting involved can be strenuous. However, this is less exhausting than lifting heavy saucepans filled with water on to solid top stoves; back problems are frequently associated with this kind of activity within the catering profession.

TABLE 12 - BOILING KETTLES - Comparitive Utilization

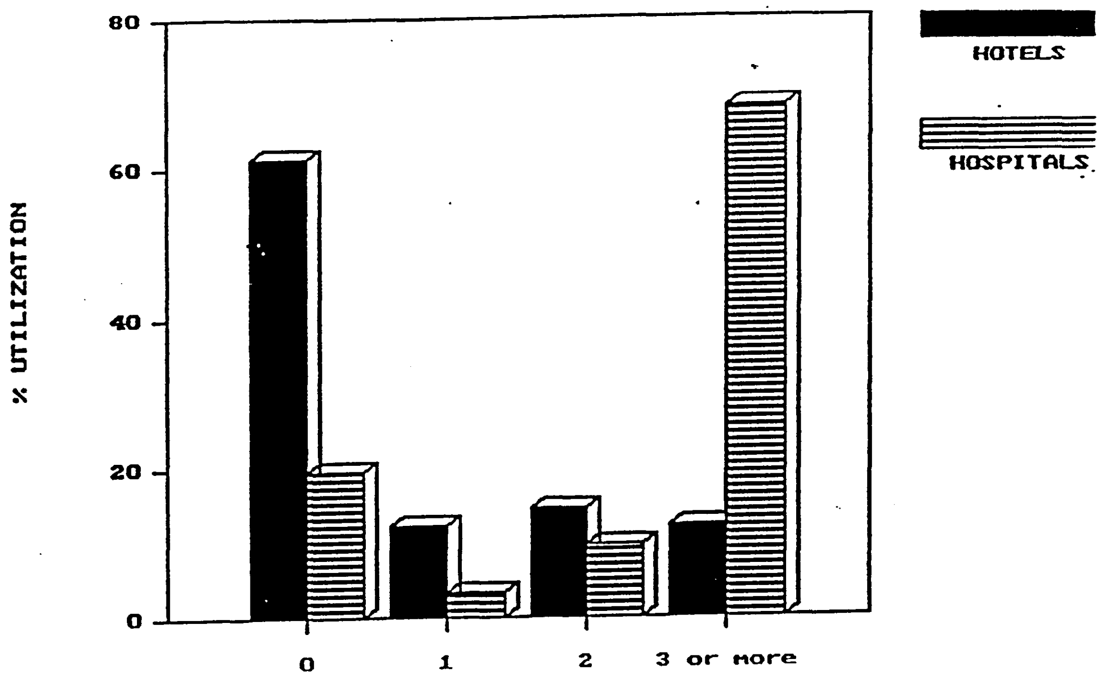


Figure 1 - NO OF BOILING KETTL

TABLE 12 - BOILING KETTLES - % Utilizing one or more

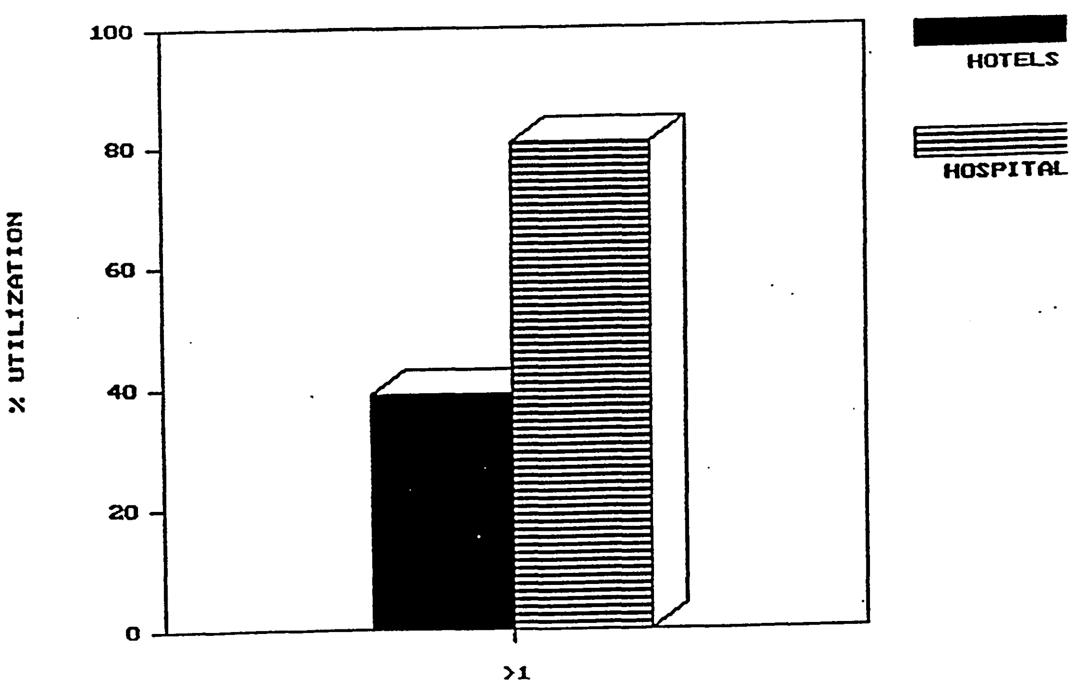


Figure 2 - ONE OR MORE BOILING

TABLE 12 - BOILING KETTLES

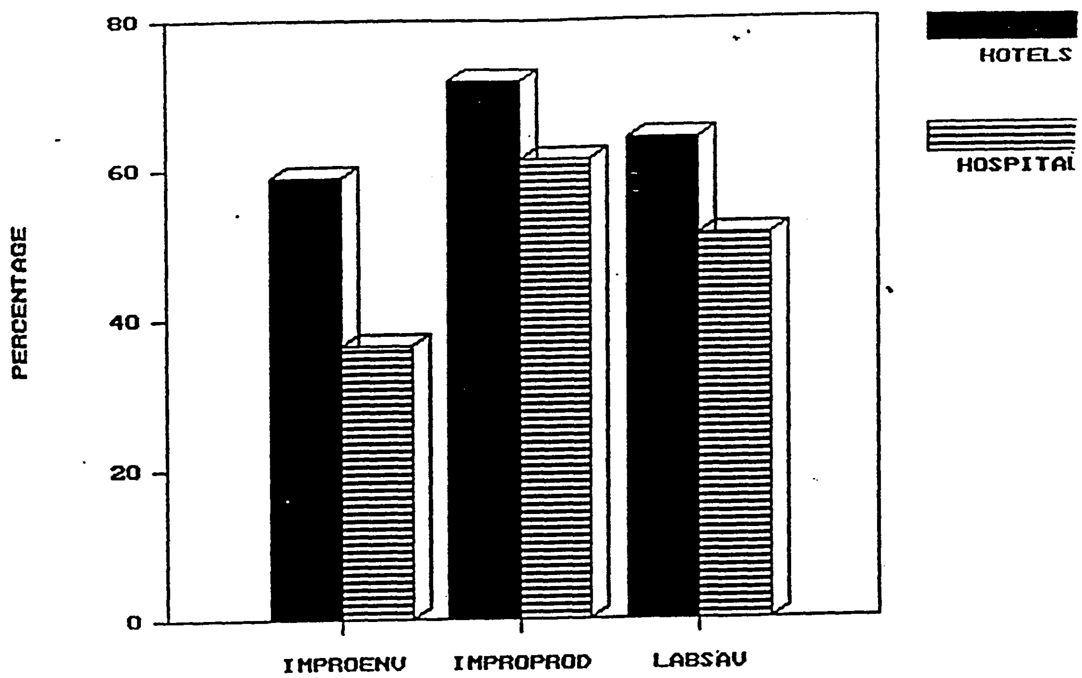


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

GRILL

Figure 5.1 Row 13 (Source Table 13)

Overall utilisation

The grill is widely viewed as an essential part of the kitchen production equipment. According to the survey, 96% of hotels and 93% of hospitals make use of a grill. Even something as simple as bacon for the traditional English breakfast is quicker to cook under a grill than on any other equipment, although for some hospitals, bacon could be cooked in an oven, primarily because of the quantities of portions required. However, the grill remains necessary to cope with the number and variety of dishes which need to be grilled or browned at any meal.

The grill is quicker, uses less fuel for browning food items and gives off less heat than an oven (the alternative method of browning). 'Flashing' is a technique used by hotels for à la carte service, to bring food portions up to the required temperature and colour before service, and the grill is generally conveniently located near the hotplate. (In the kitchen plan, Case Study 1, the grills are situated at the end of each island of equipment). Hospitals deal mainly with bulk cooking, and therefore use the 'flashing' technique less, using ovens more for finishing and browning.

Reasons for utilisation

1. Improve environment

According to the survey, 47% of hotels, 29% of hospitals report an improved environment. The research indicates that a grill does not specifically improve the environment within the food production area. The grill is turned on at breakfast time and is the last item to be switched off and therefore generates a lot of heat during an eighteen-hour day.

Many staff burn themselves on this apparatus when trying to dislodge toast or saving an item from burning under the intense heat (human flesh comes secondary to a fillet steak being grilled to perfection for a customer!)

2. Improve productivity

The percentage return endorsing improved productivity from the survey is 52% of hotels, 32% of hospitals. For hotels, the grill is essential for increased speed of cooking required for à la carte service. Within hospitals, the grill is needed for a smaller variety of items, and is therefore not seen as an aid to productivity when large quantities are being produced, although it is an aid to speed when browning or finishing is needed, to achieve the correct colour (for example au gratin dishes).

Although it does not obviously increase productivity per se, by reason of its flexibility it certainly contributes to the overall performance of the kitchen. It may well be that its inherent versatility is somewhat taken for granted.

3. Labour saving

According to the survey, 36% of hotels, 32% of hospitals regard the grill as labour saving. This indicates that neither hotels nor hospitals assess this as a particularly labour-saving piece of equipment. The main disadvantage is the difficulty in controlling the intense heat, and the ease with which food can be burnt or spoiled. However, one advantage is that it is traditionally situated near the hotplate or servery to allow staff to 'flash' and serve the food at the correct temperature within a short space of time without having to walk a great distance to the hotplate. But the user is limited in the amount of plated food that can be 'flashed' at one time. Possibly the future of the standard grill could be in doubt with the usage of the new 'Combi Grill'. This is particularly useful for pre-cooked batched items, for example shepherds pie, which can be re-heated and browned by this machine. But the main advantage is that this item of equipment is simple to use.

TABLE 13 - GRILLS - Comparitive Utilization

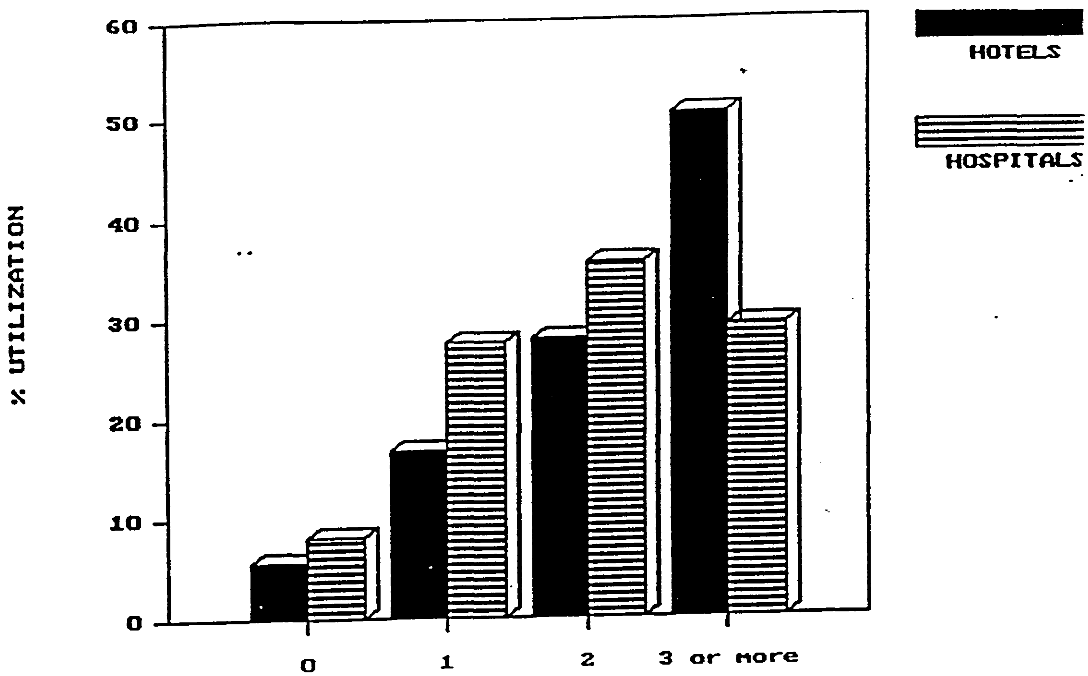


Figure 1 - NO OF GRILLS

TABLE 13 - GRILLS - % Utilizing one or more

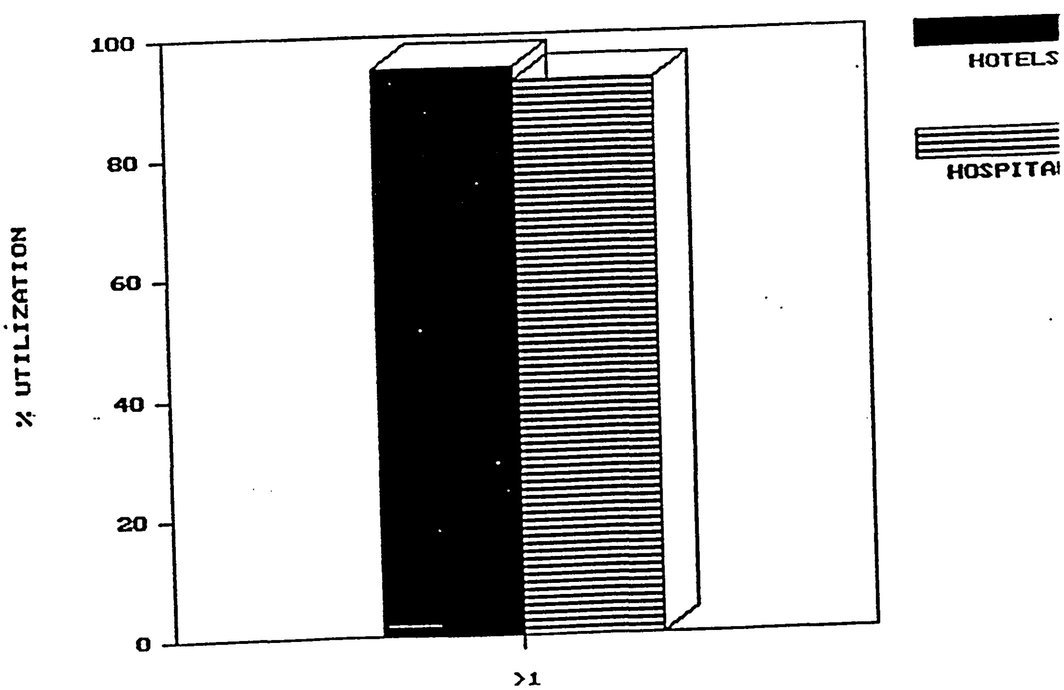


Figure 2 - ONE OR MORE GRILLS

TABLE 13 - GRILLS

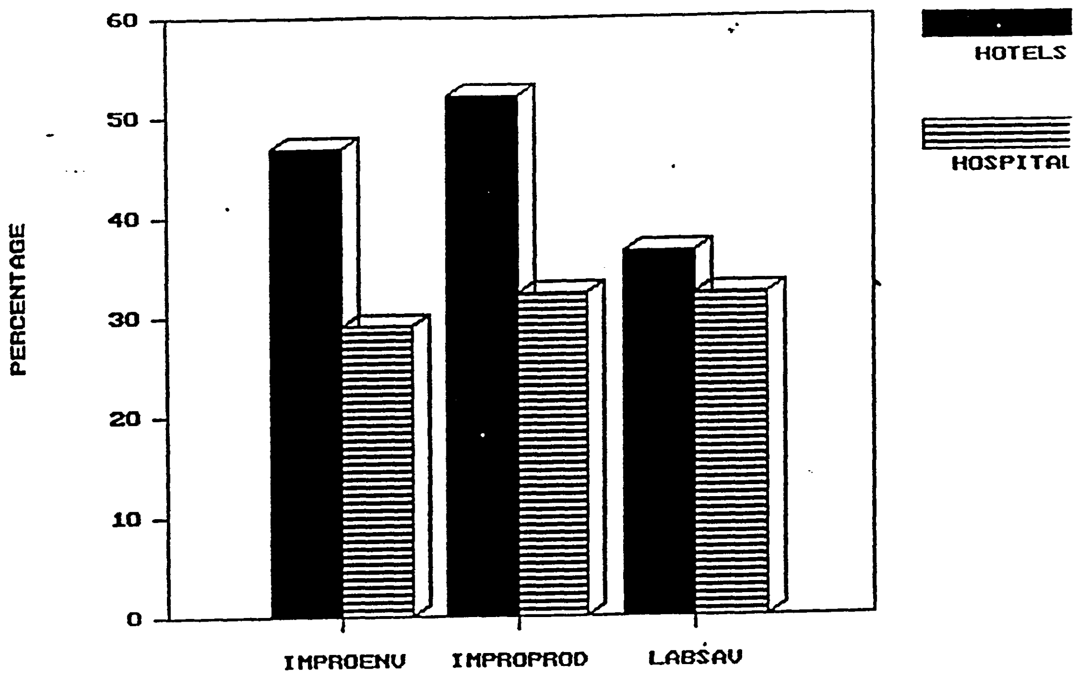


Figure 3

<u>KEY</u>

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**

CHARGRILLS

Figure 5.1 Row 14 (Source Table14)

Overall Utilisation

Here, there is a great differential between hotels and hospitals which have chargrills (65% of hotels and 4% of hospitals). The explanation has to lie in the different type of menu offered by the two catering operations. The chargrill has limited use, mainly utilised for individual portions. Hotels use the chargrill for cooking steaks or kebabs, similar to an indoor barbecue, without the disadvantages of charcoal, as the heat is controllable and the fuel smell minimal. Hospitals cater for bulk portions, for which chargrills are not ideal. It is an expensive piece of equipment to purchase when compared to the grill, for such specialised use.

Reasons for utilisation.

1. Improve environment

The survey showed that only 45% of hotels and 50% of hospitals using the chargrill reported benefits for improvement to the environment. The distinctive aroma of chargrilled food can be considered as attractive to the customer, or it can be overwhelming, and therefore a disadvantage. The limited use of the chargrill, normally in operation only during service time, not all day, avoids the excess of heat which a grill, left on all day, produces; however, the intense heat of the chargrill, while in use, can adversely affect the environment.

2. Improve productivity

Of those establishments using chargrills, 58% of hotels and 4% of hospitals reported the benefits of improved productivity. The main advantage over the traditional grill is in the flavour and appearance of the cooked food (barbecued without tasting burnt). The chargrill is therefore used for a specific type of cooking. Many models of the chargrill have a graduated heating arrangement which enables meat to be kept hot without overcooking. Hospitals use chargrills primarily for staff catering, where it is assessed as a novelty and associated with healthy eating.

3. Labour saving

The percentage here, 43% of hotels, 50% of hospitals in the survey, indicate a divided opinion. The chargrill is easy to use and chefs can observe the cooking process more easily than with a conventional grill, but it is a labour-intensive item of equipment, requiring the user's full attention throughout the cooking and service period. As a specialised piece of equipment, it is not necessarily used every day, but depends on the choice of menu.

TABLE 14 - CHARGRILL - Comparitive Utilization

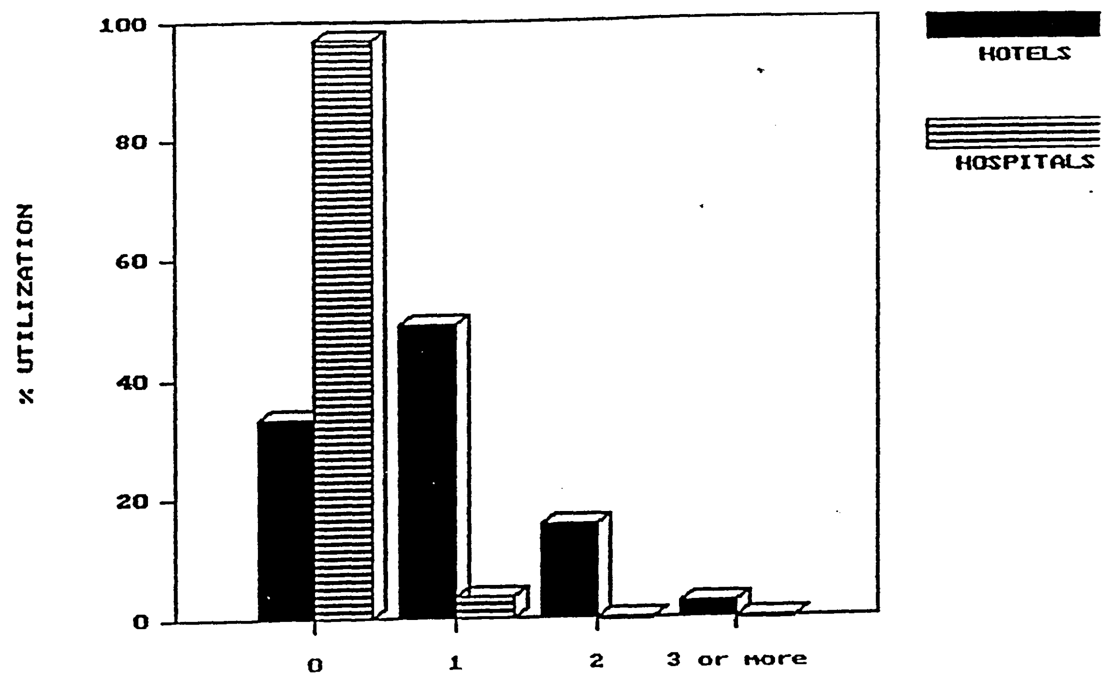


Figure 1 - NO OF CHARGRILLS

TABLE 14 - CHARGRILLS - % Utilizing one or more

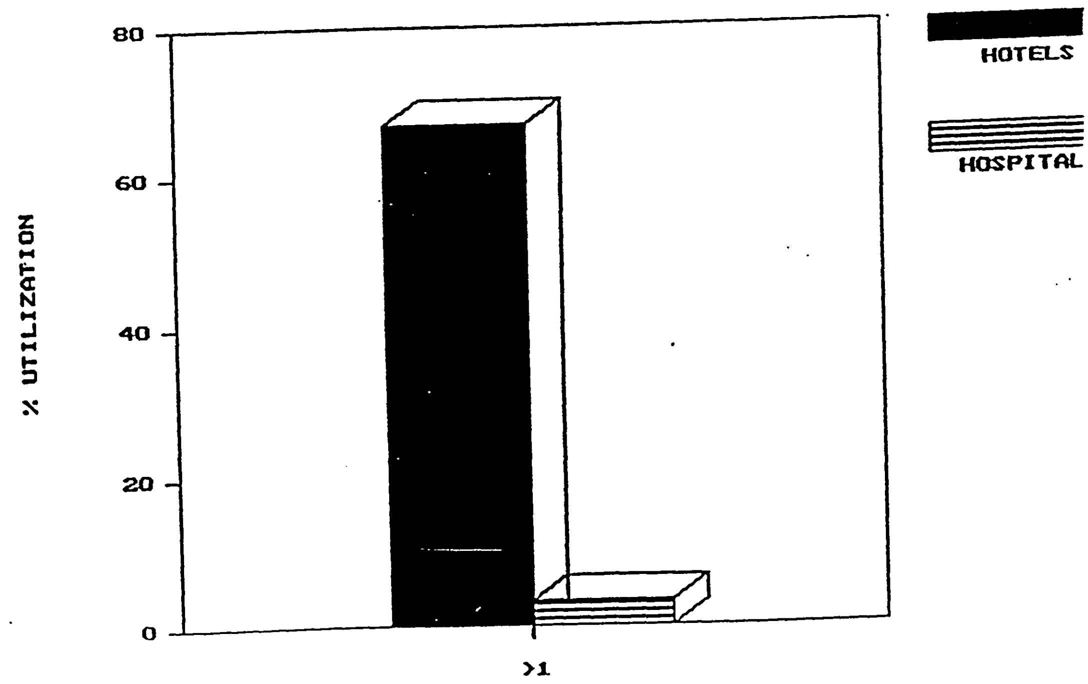


Figure 2 - ONE OR MORE CHARGRI

TABLE 14 - CHARGRILLS

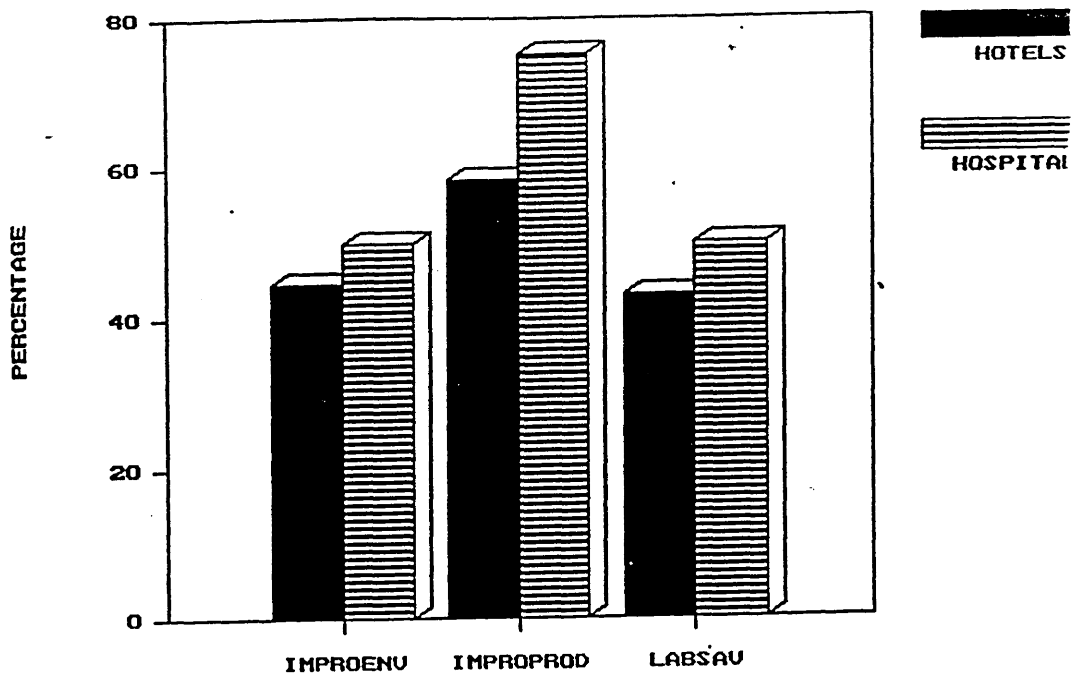


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

GRIDDLES

Figure 5.1 Row 15 (Source Table 15)

Overall utilisation.

As an item of catering equipment, griddles have been in use for a long time, although the results of this survey show that only 41% of hotels and 19% of hospitals use or have a griddle - a surprising finding, as there are very few prime cuts of meat which don't griddle well, and as a cooking method it gives colour and retains the flavour of the food. It may be that, with the modern emphasis on healthy eating, grilling or chargrilling is becoming preferable to griddling or frying; also, red meat consumption is falling, in favour of white meat or fish, which may affect cooking methods. In addition, the griddle can produce only limited amounts of food, as the surface area is small, and hospitals do not find griddles suitable for the large amounts of food produced, whereas hotels can make greater use of the griddle for an à la carte menu, particularly for steaks. No doubt a bratt pan can also be used to produce griddle-cooked food (such as a full English breakfast) because of its size and ability to produce the quantities required especially by hospitals.

Reasons for utilisation

1. Improve environment

Of the establishments using griddles, 49% of hotels and 26% of hospitals feel it offers a cleaner working environment, provided it is placed under an extraction hood. It is easy to use and clean, with no hidden areas for grease to collect. However, it does produce excessive heat or vapour to add to the kitchen atmosphere, even if under extraction. Hospitals, with their cyclical menus, make less use than hotels of griddles, with which they are less familiar, due to their limited menus, (i.e. no à la carte.)

2. <u>Improve productivity.</u>

The survey shows that 68% of hotels and 47% of hospitals considered it produces better food more quickly. It helps to preserve moisture, unlike the dry heat of the grill, and has the visual advantage of the food being easily accessible during the cooking process, unlike the oven or grill. However, it does not lend itself to particularly imaginative cooking; it is the sauce that accompanies the meat or fish which provides the piquancy of the flavour. Hospitals find the griddle too time-consuming for the large number of items produced, for example, 300 pork chops for hospital patients in comparison with 60 steaks for hotel customers.

3. <u>Labour saving</u>

According to the survey, 50% of hotels and 53% of hospitals rate the griddle as labour-saving, as it is easy to use, and with its efficient temperature controls can reduce fuel consumption. Also, with the griddle in operation, the kitchen can be more effectively organised, with burners and pans kept free for other cooking purposes. Although there is certainly a big differential between the hotels and hospitals who use griddles, they both agree that it is labour-saving and assists staff in recognising the "doneness" of food.

TABLE 15 - GRIDDLE - Comparitive Utilization

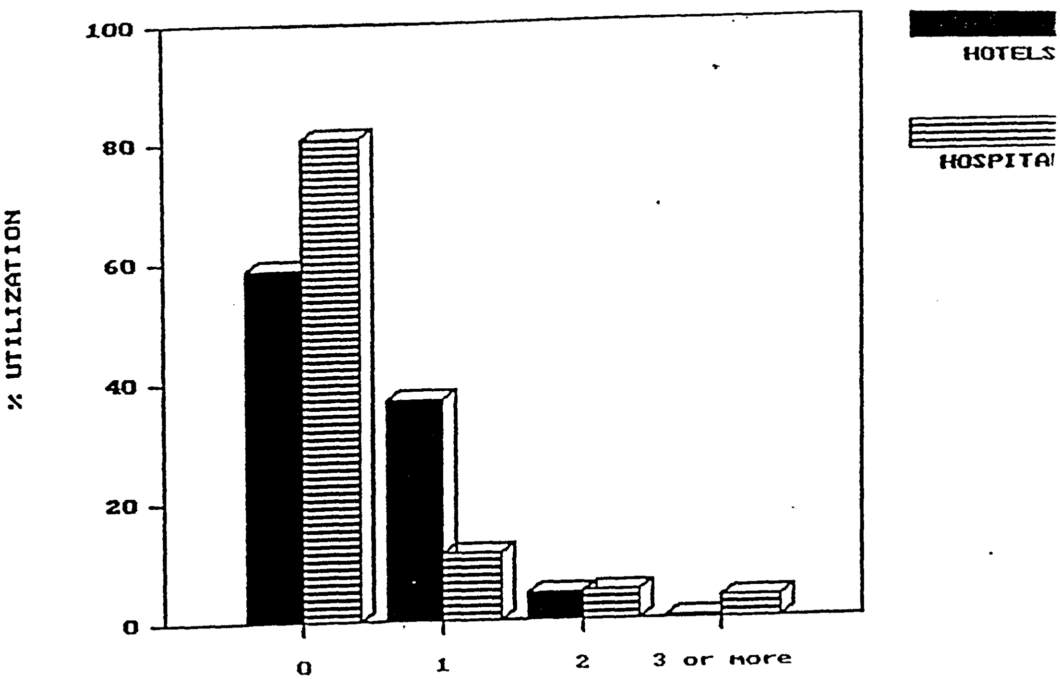


Figure 1 - NO OF GRIDDLES

TABLE 15 - GRIDDLE - % Utilizing one or more

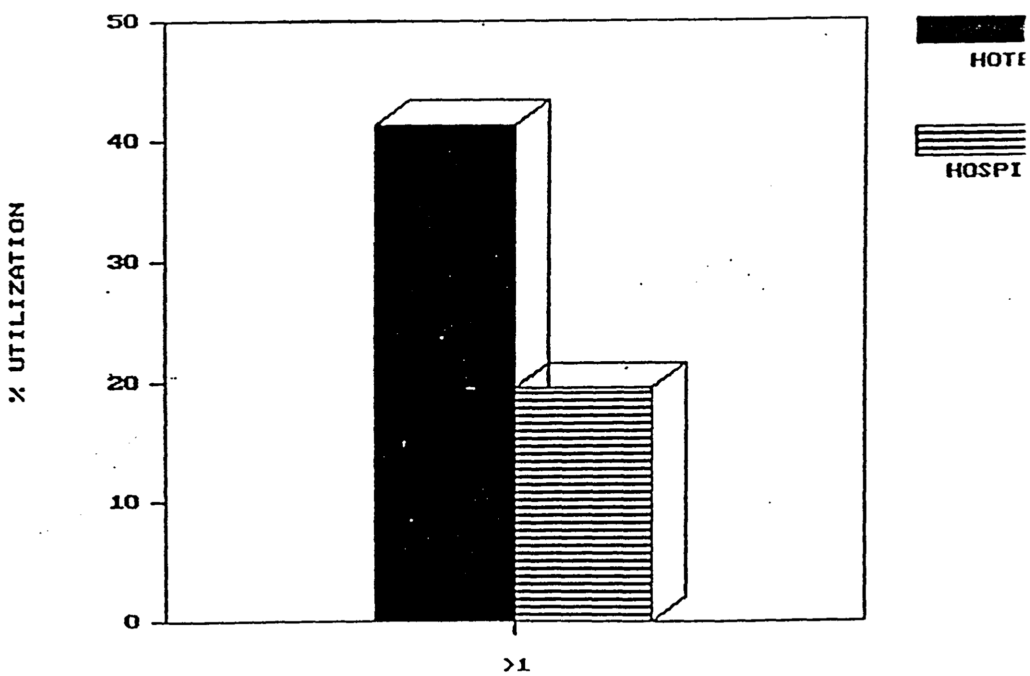


Figure 2 - ONE OR MORE GRIDDLE

TABLE 15 - GRIDDLE

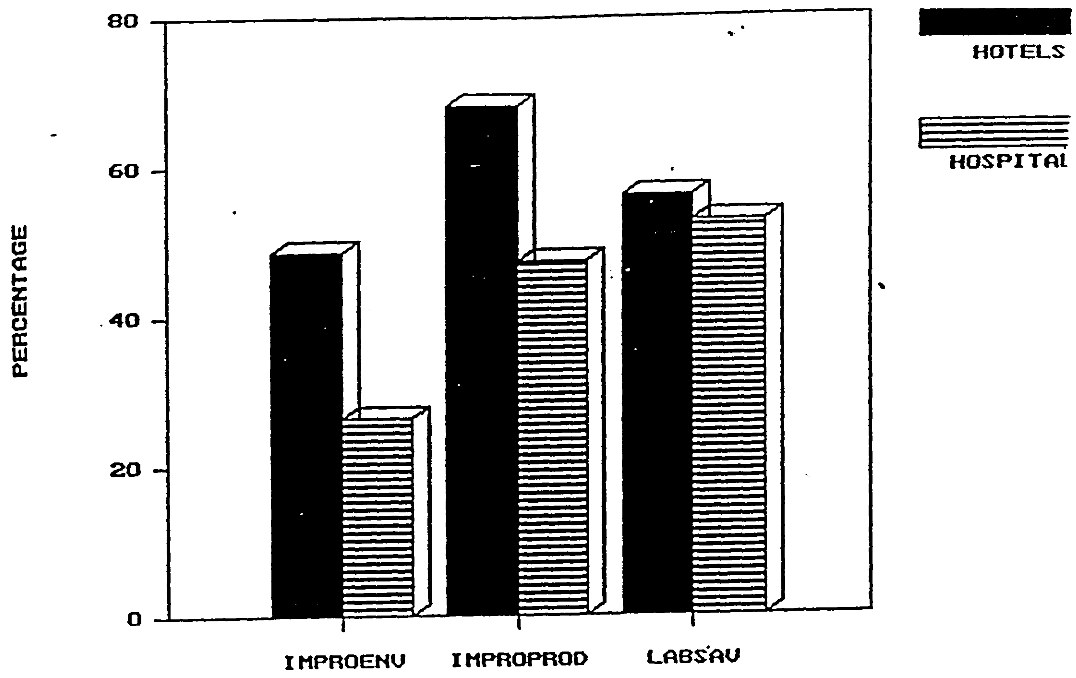


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

Figure 5.1 Row 16 (Source Table 16)

Overall utilisation

At the time of the survey, 65% of hotels, 76% of hospitals report the use of chillers, as in many kitchens chilled storage is required for holding food which is awaiting preparation, being prepared or held for service. The chiller is essential for cook-chill operations, where the food, once cooked, has to reach the temperature of 3°C within 90 minutes of being cooked. Many smaller establishments would be dependent on conventional refrigeration, rather than chillers.

Reasons for utilisation

1. Improve environment

The survey shows that 87% of hotels, 77% of hospitals report an improved environment. Under the terms of the new Food Safety Act 1990, staff need to be trained more precisely on the necessity of correct food storage within refrigeration (raw food kept separately from cooked food). An advantage of chillers is that cooked hot food can reach the correct storage temperature more quickly than food left in the hot humid atmosphere of a kitchen, which may often lead to food poisoning.

2. Improve productivity

Under the survey, 81% of hotels, 73% of hospitals report the contribution of the chiller to increased productivity. Some form of chiller refrigeration is essential for foods to retain their edibility and appearance for consumption. The general public expects to find chilled cabinets or trolleys for cold displays of food. In many modern kitchens, reach-in cabinets or under-workshop refrigeration are used to assist the chef with convenient and safe food supplies and to retain freshness. Food deterioration, with the resultant wastage, is therefore greatly reduced.

3. Labour saving

86% of hotels, 75% of hospitals in this survey view this apparatus as labour saving. The chiller/refrigerator is seen by many chefs as an extension of the cooking process. Without these appliances, food acceptability is in doubt, as raw/cooked food left in the kitchen atmosphere will deteriorate quickly. This leads to increased costs for replacing items, and also creates extra work and time expenditure for the chef in the reproduction of the food.

TABLE 16 - CHILLER - Comparitive Utilization

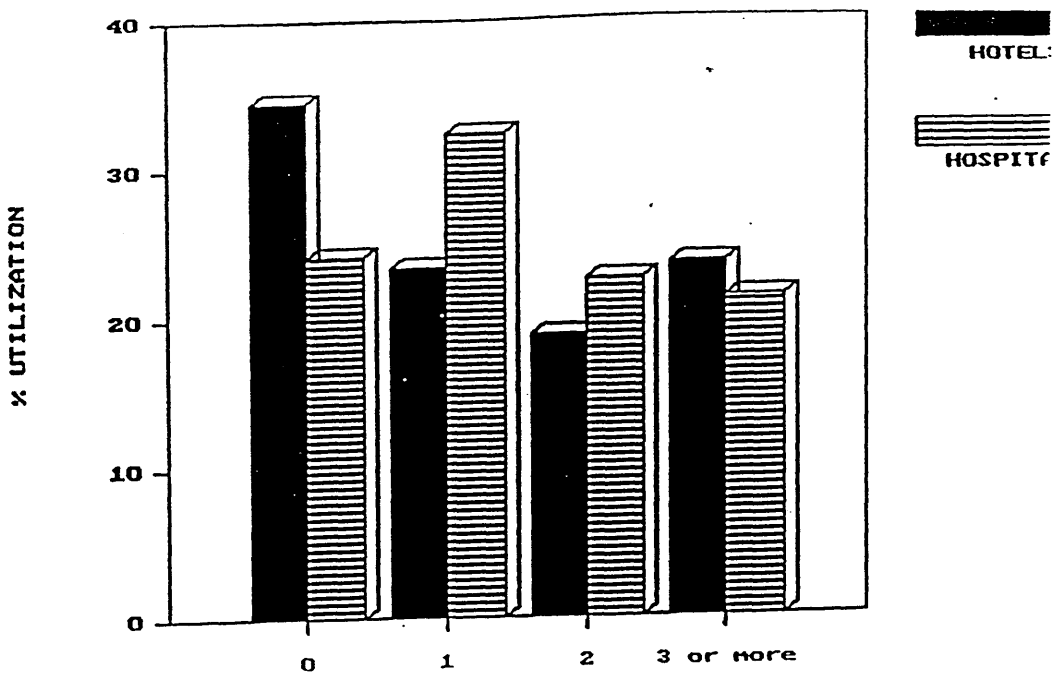


Figure 1 - NO OF CHILLERS

TABLE 16 - CHILLERS - % Utilizing one or more

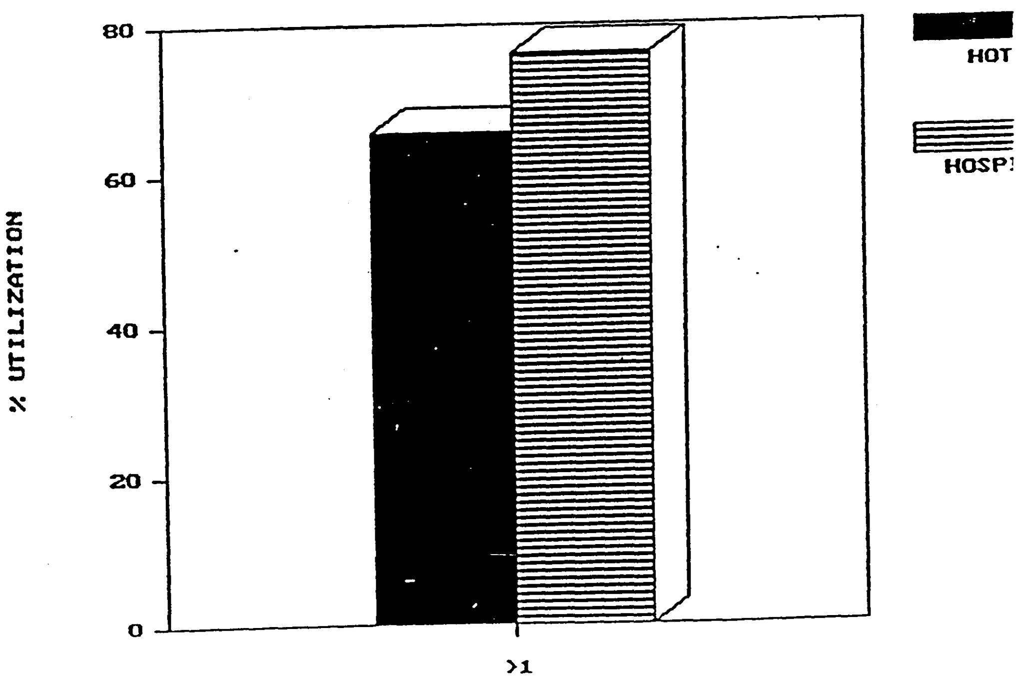


Figure 2 - ONE OR MORE CHILLER

TABLE 16 - CHILLERS

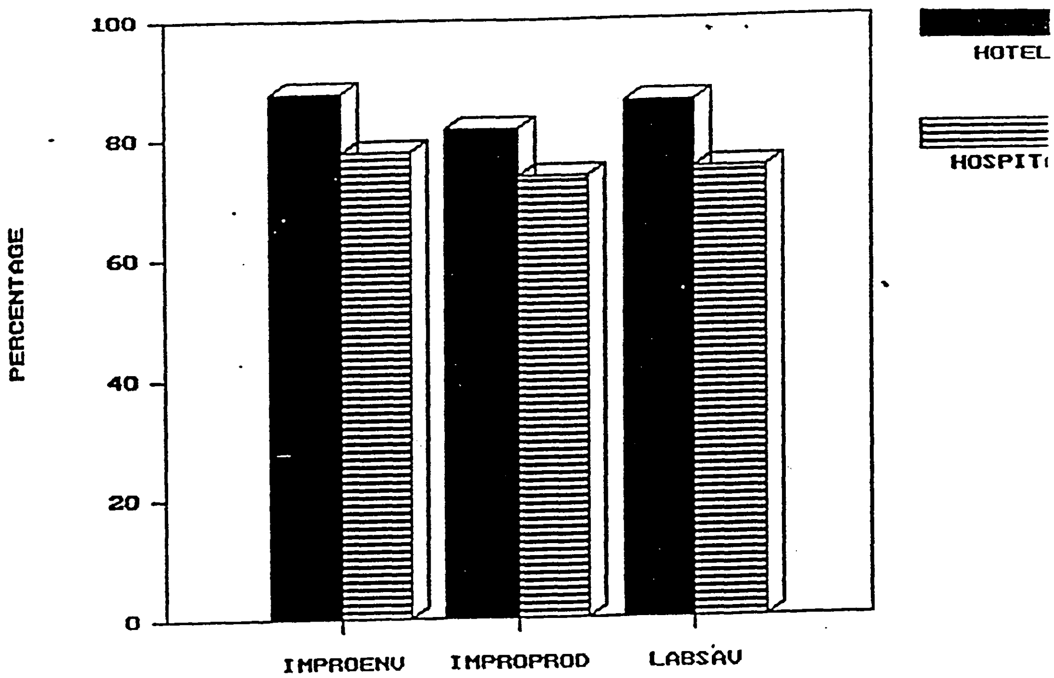


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

FREEZER

Figure 5.1 Row 17 (Source Table 17)

Overall utilisation

This is an essential part of all catering operations, and is used for raw or cooked commodities in the kitchen and in the service area. 75% of hotels, 75% of hospitals use the freezer for bulk food storage. Either walk-in or reach-in freezers are used. Because of the importance of temperature control, many cabinets are fitted with digital temperature controls to register the temperature zone of -18°C to -20°C.

Reasons for utilisation

1. Improve environment

Figures of 25% of hotels, 24% of hospitals from the survey indicate that this item is not established as improving the environment, but considered simply as an essential form of food storage.

2. Improve productivity

Figures of 24% of hotels, 17% of hospitals from the survey indicate that the freezer is viewed less as an aid to productivity than simply as a storage area for convenience foods, such as vegetables, or ready-prepared meats; consideration is not given to the alternative of staff having to prepare and trim vegetables or to cut meat into joints. It is taken for granted that a catering kitchen would have a freezer, and the increased productivity this item allows is also taken for granted.

3. Labour saving

Figures of 21% of hotels, 15% of hospitals from the survey show that freezers are considered an indispensable adjunct to catering operations, but not fully recognised as the labour-saving appliances they certainly are.

TABLE 17 - FREEZER - Comparitive Utilization

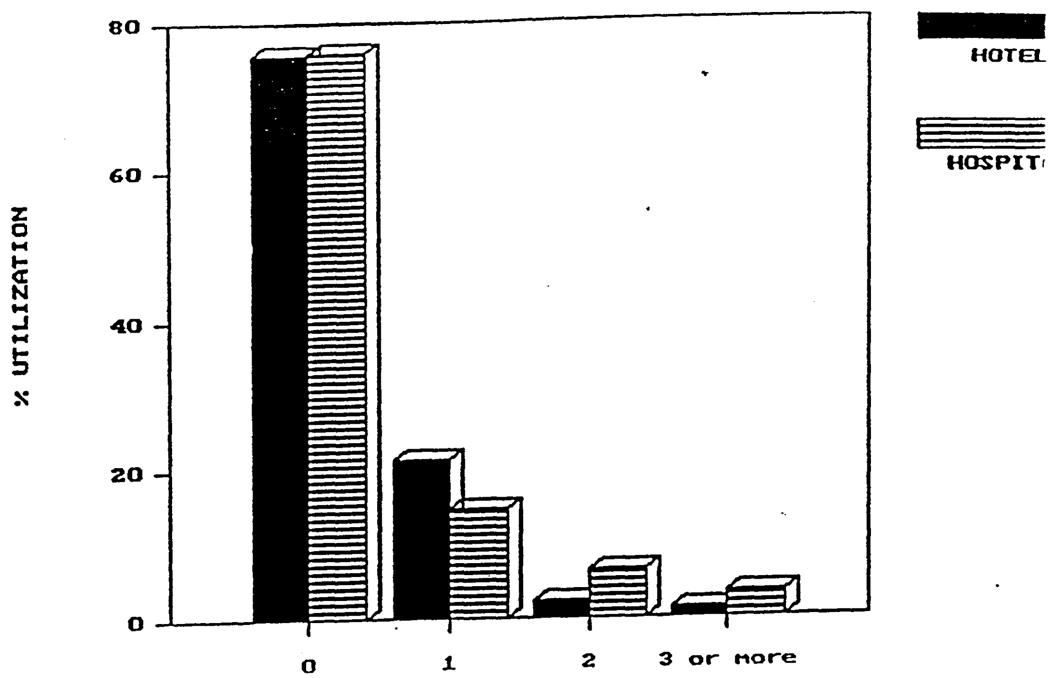


Figure 1 - NO OF FREEZERS

TABLE 17 - FREEZERS - % Utilizing one or more

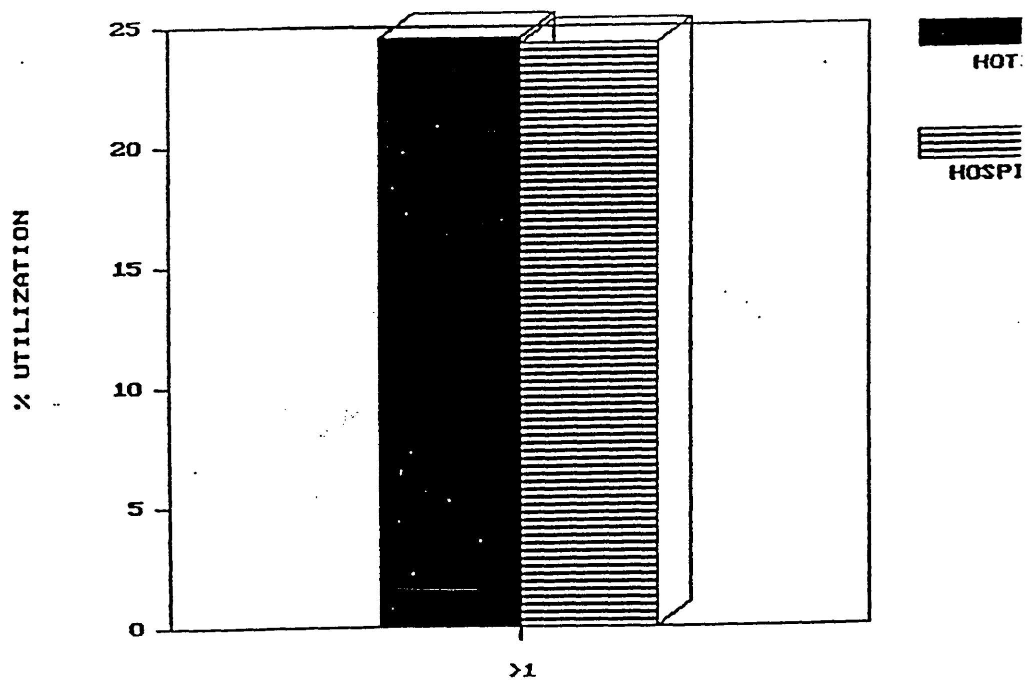


Figure 2 - ONE OR MORE FREEZER

TABLE 17 - BLAST FREEZERS

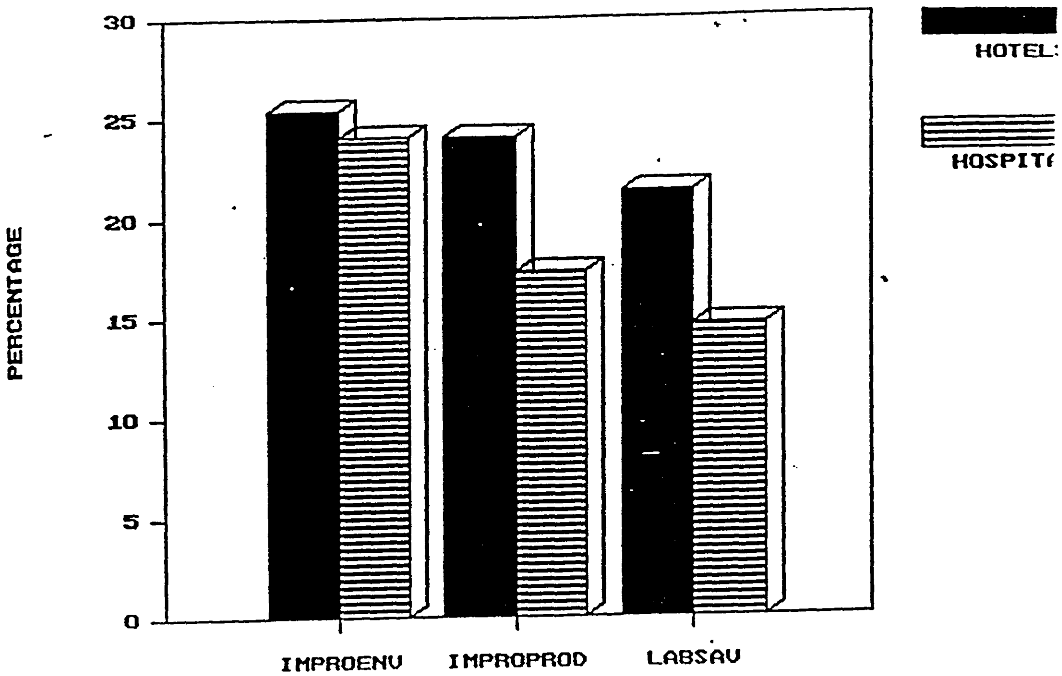


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

FOOD PROCESSOR

Figure 5.1 Row 18 (Source Table 18)

Overall utilisation

At the time of the survey, 82% of hotels, 59% of hospitals used a food processor. This is a versatile machine, as the speed of the blade can be varied and a number of different attachments can be used for chopping, beating or aeration. Food processors can vary from table-top models to free-standing ones, which can be used for pureeing soups.

Reasons for utilisation

1. Improve environment

According to the survey, 67% of hotels, 81% of hospitals report an improved environment. Because of its versatility, this machine can be employed for many tasks, which removes some of the pressure from staff who would otherwise need to use manual methods for food preparation; thus less staff energy is demanded, less staff heat generated, both physically and in emotional tension, resulting in a less stressful environment.

2 Improve productivity

The survey shows that 85% of hotels, 83% of hospitals use the food processor to achieve a consistent standard of produce. It is therefore an invaluable item for catering staff. This is verified by the high response under this heading.

3. Labour saving

According to the survey, 86% of hotels, 85% of hospitals agree that this piece of equipment is labour saving, as it dispenses with many of the simple manual tasks necessary to achieve an end product: for instance, whisking egg white or cream that, even for small amounts, can be time-consuming and laborious, especially when attempting to carry out three preparation methods for one dish (for example soufflé

Milanese). The food processor achieves good results, and is of great benefit to the staff.

TABLE 18 - FOOD PROCESSOR - Comparitive Utilization

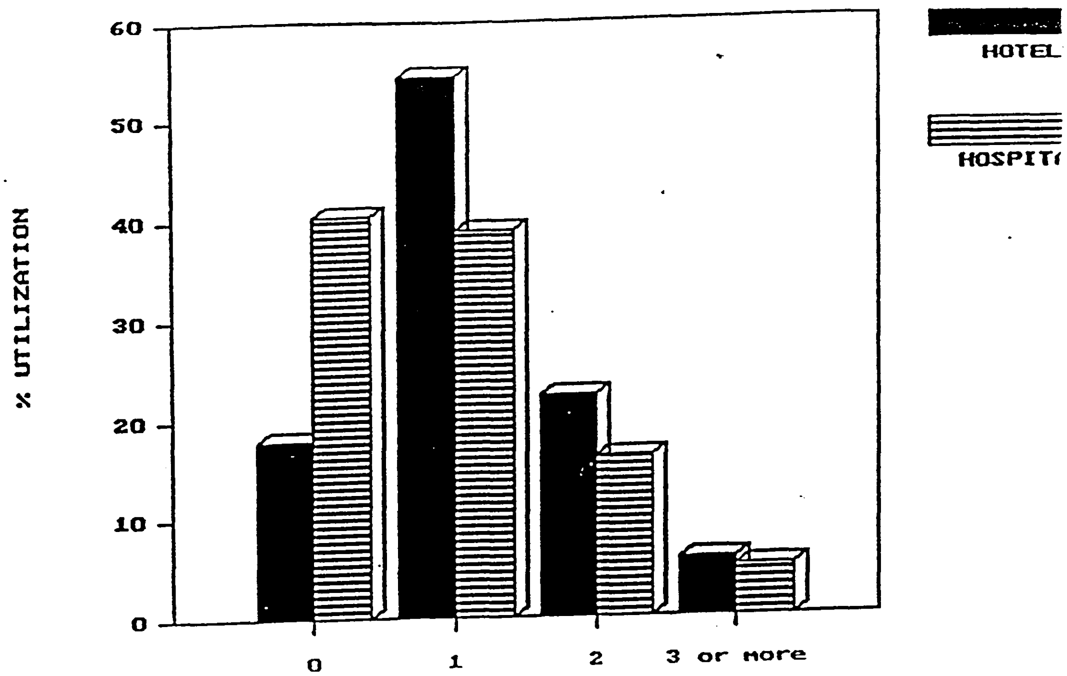


Figure 1 - NO OF PROCESSORS

TABLE 18 - FOOD PROCESSOR - % Utilizing one or more

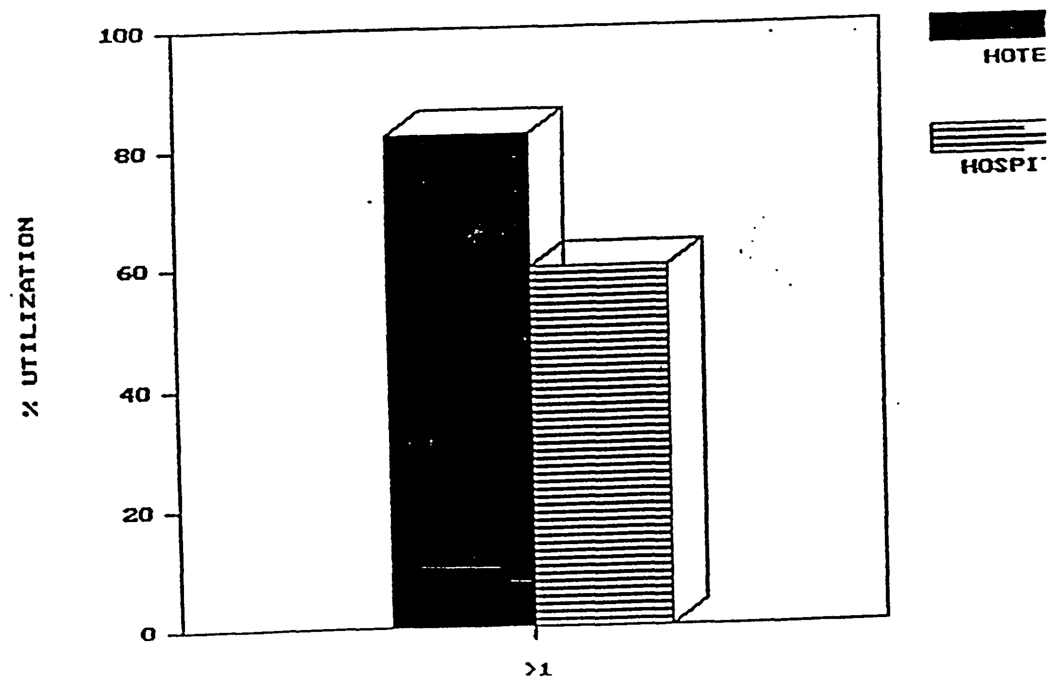
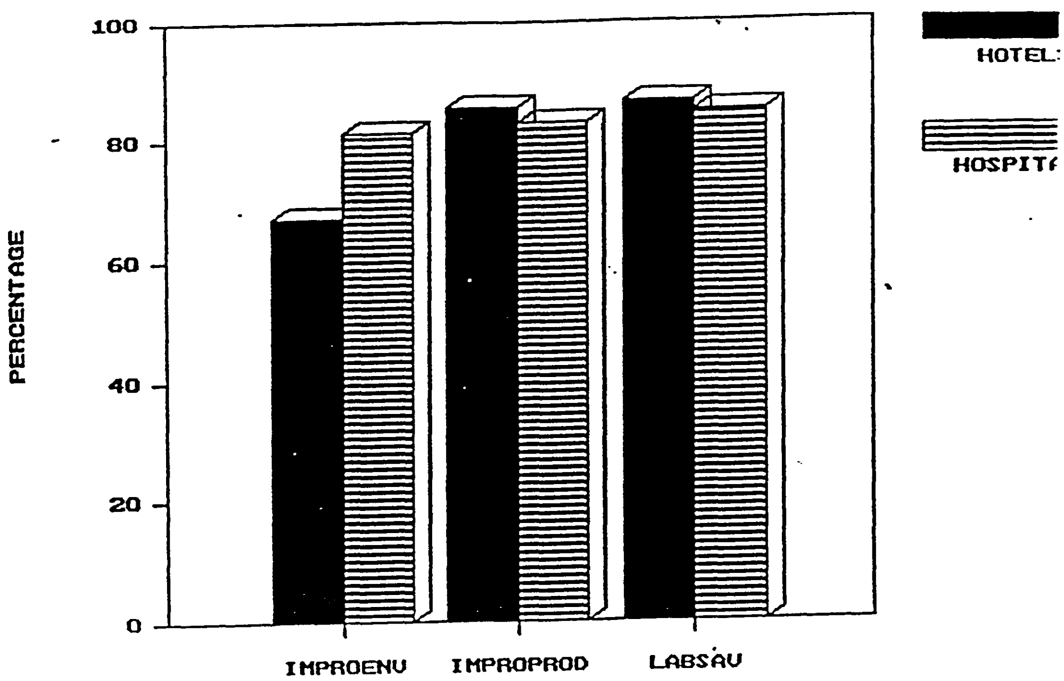


Figure 2 - ONE OR MORE PROCESS

TABLE 18 - FOOD PROCESSORS



Fi9gure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

VEGETABLE PREPARATION MACHINE

Figure 5.1 Row 19 (Source Table 19)

Overall utilisation

At the time of the survey, 54% of hotels, 59% of hospitals use a vegetable preparation machine for food production. This machine is very similar to the food processor for versatility in the sense that it has interchangeable attachments, to achieve slicing, dicing or grating results.

Reasons for utilisation

1. Improve environment

The survey shows that 57% of hotels, 66% of hospitals consider the vegetable preparation machine an aid to an improved environment. Although used for various food preparation techniques, this machine does not usually generate excess noise or heat to deter the staff within their working environment.

2. Improve productivity

According to the survey, 74% of hotels, 93% of hospitals, report improved productivity. This machine is a great asset in achieving a high-standard, consistent product for the chef. This is particularly important for bulk cooking as in hospitals, but also within hotels to achieve fine cuts of vegetables for soups and garnishes.

3. Labour saving

The survey shows that 74% of hotels, 98% of hospitals agree that the vegetable preparation machine is labour saving. It allows staff to reduce their workload from manually preparing foods, with the knowledge that the vegetable preparation machine will produce the required results in less time and to an acceptable standard.

TABLE 19 - VEG PREP MACHINE - Comparitive Utilization

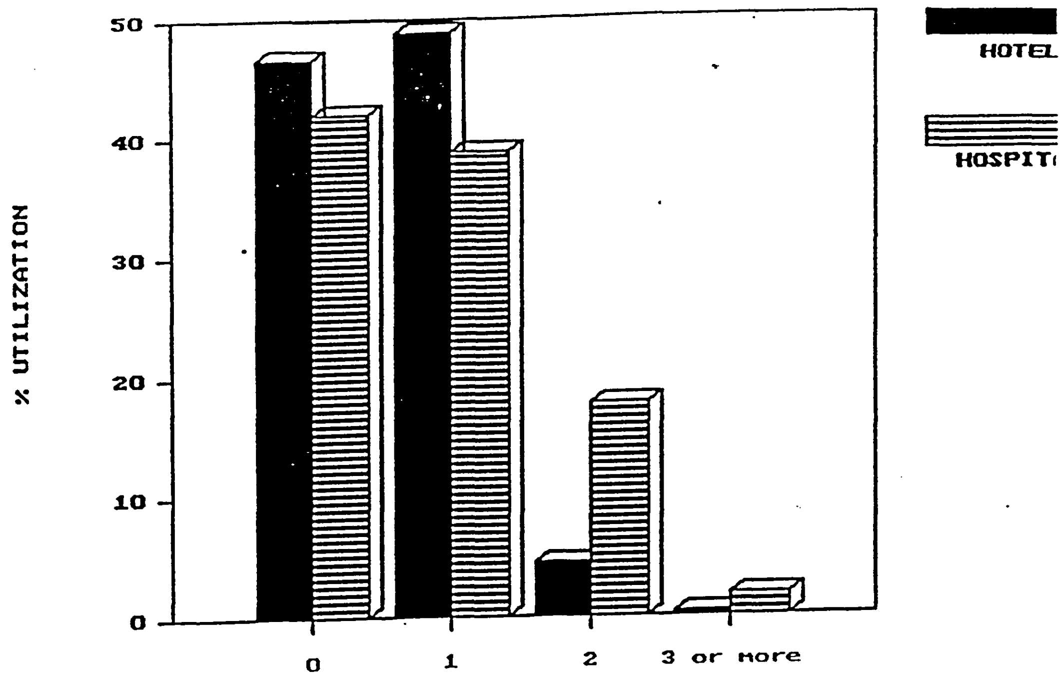


Figure 1 - NO OF VEG PREP MACH

TABLE 19 - VEG PREP MACHINES - % Utilizing one or more

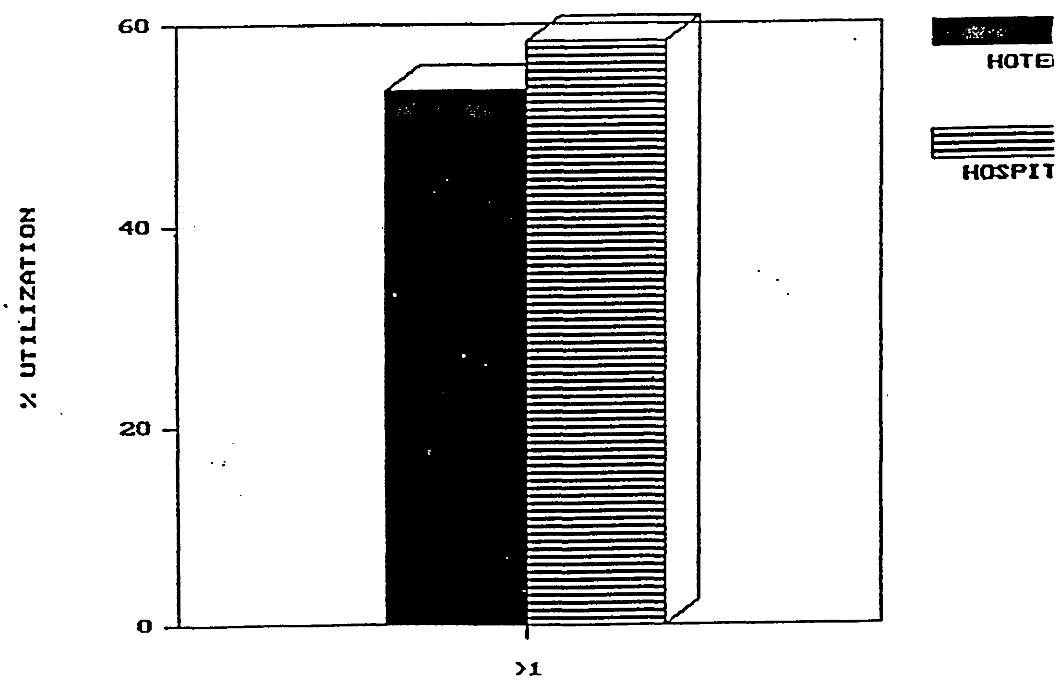


Figure 2 - ONE OR MORE VEG PRE

TABLE 19 - VEG PREP MACHINES

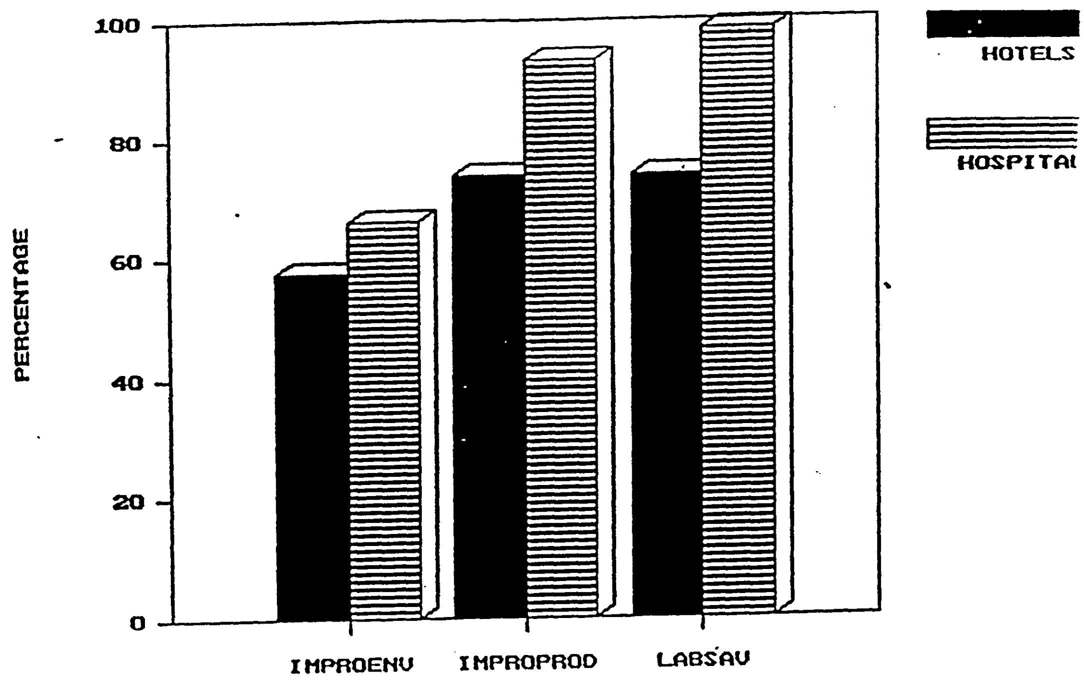


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

BOWL CHOPPERS

Figure 5.1 Row 20 (Source Table 20)

Overall utilisation

Although industrial sized bowl choppers have been produced and used for many years, it would appear from the research that only 34% hotels and 22% hospitals actually use them for food preparation. This reflects lack of knowledge of the equipment or rejection on the grounds that it has limited use, with a rotating knife and bowl which can only chop or puree foods.

Reasons for utilisation

1. Improve environment

50% of hotels, 72% of hospitals in the survey assess this item favourably. As an aid to food preparation the bowl chopper does not produce a lot of noise and certainly generates little heat compared with other mixers or shredding machines, thus contributing to an improved environment.

2. Improve productivity

70% of hotels, 41% of hospitals in the survey consider that productivity is improved. The variance here relates to the type of food preparation/menu required by hotels or hospitals. Within the five star hotels the bowl chopper is used continually for finely chopping vegetables for 'terrines' or 'duxelles' and to obtain fine meat puree for 'quenelles'. Within its limited hospital usage, it is mainly employed for finely chopping meats and vegetables for patients on special diets, or to assist in the preparation of soups.

3. Labour saving

The survey shows that only 27% of hotels, 17% of hospitals find the bowl chopper to be a labour saving device. This may partly depend on the quantity of finely-chopped or pureed food required. Many traditional chefs would prefer to chop vegetables or meat into 'brunoise' as this is recognised as a knife skill that takes practice and expertise to perfect, and is rated highly among the peer group. A machine cannot better this 'art' for food presentation in for example, consomme brunoise or julienne. However, the bowl chopper does alleviate the tedious task of routine chopping of meats or vegetables, and is undoubtedly a labour saving device for large quantities of meat and vegetable preparation, as observed both within five star hotels and large hospital kitchens. However, the cost of this one non-versatile item may be one factor in explaining the low percentage return in the survey, especially from hospitals.

TABLE 20 - BOWL CHOPPER - Comparitive Utilization

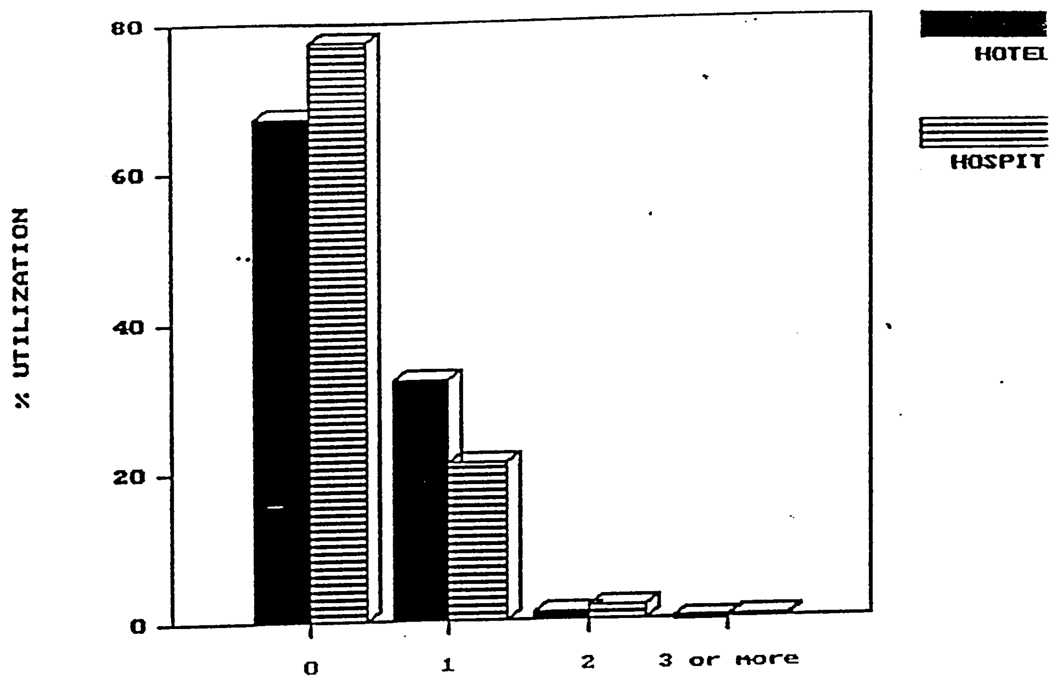


Figure 1 - NO OF BOWL CHOPPERS

TABLE 20 - BOWL CHOPPER - % Utilizing one or more

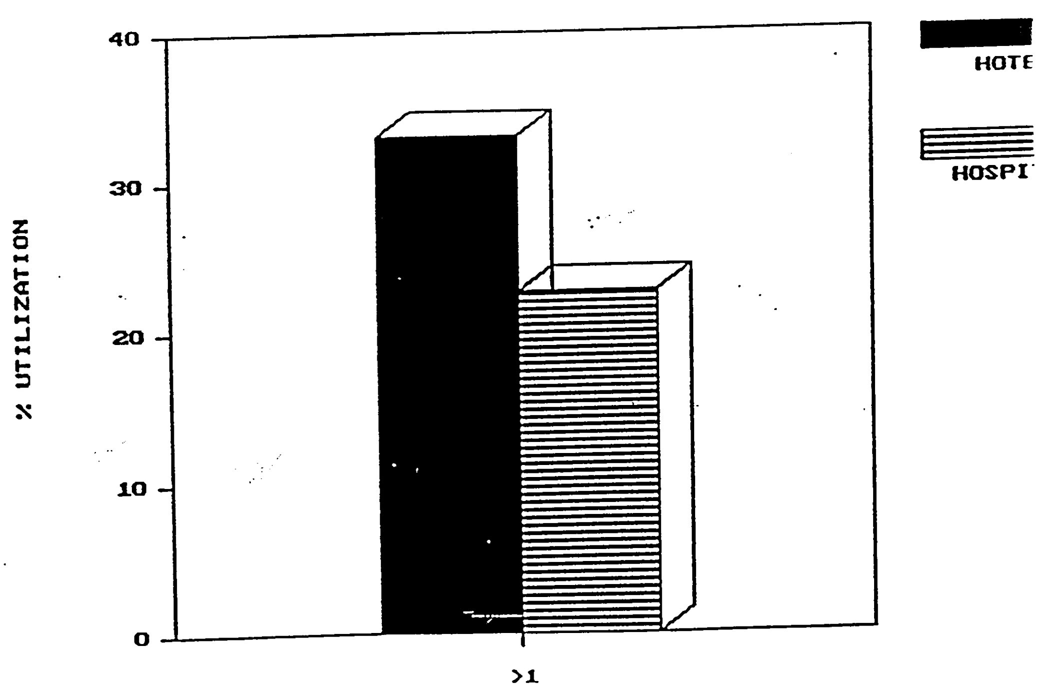


Figure 2 - ONE OR MORE BOWL CH

TABLE 20 - BOWL CHOPPERS

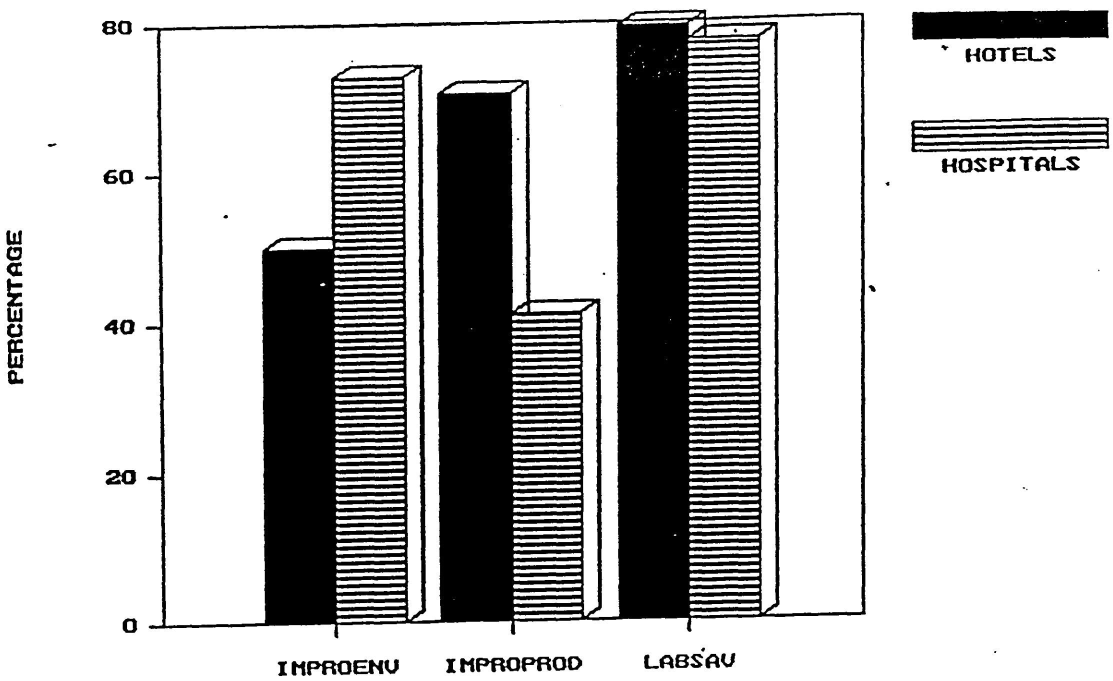


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

VACUUM PACKERS

Figure 5.1 Row 21 (Source Table 21)

Overall utilisation

30% of hotels, 4% of hospitals in the survey are using vacuum packers to extend the shelf life of the food product. Within hotels, vacuum packers are used to ensure that the raw/cooked product is protected from bacteria during the storage period. Hotels using cook-chill or partial cook-chill are using vacuum packers to assist in individual portioning of foods so that the food product can then be reheated correctly to obtain better presentation for the customer and assist in better portion control. Hospitals are also using the vacuum packers for portioning and storage of food, but for cook-chill they are using ovenproof cardboard packaging for easier regeneration of foods on the wards.

Reasons for utilisation

1. Improve environment

76% of hotels, 50% of hospitals in the survey assess this machine as improving the environment, in the sense that the vacuum packer does not have an adverse effect on the atmosphere or the environment of the working kitchen, and can therefore be viewed as more of an asset than a disadvantage

2. Improve productivity

According to the survey, 83% of hotels, 50% of hospitals consider that the vacuum packer improves productivity. Vacuum packing food can be an effective aid to removing the risk of the growth of most pathogens, other than spore formers, and with correct storage (0.3°C) will deter the growth of bacteria. This allows for longer shelf life and thus an increase in productivity.

3. Labour saving

The survey shows that 76% of hotels, 50% of hospitals view the apparatus as labour saving. As correct packaging and storage assists in food preservation, extending the life of the food, the kitchen production staff can benefit from 'economies of scale' in their mis-en-place (preparation before service), producing larger quantities of each item at one time for future use, rather than smaller quantities daily for immediate use.

TABLE 21 - VACUUM PACKER - Comparitive Utilization

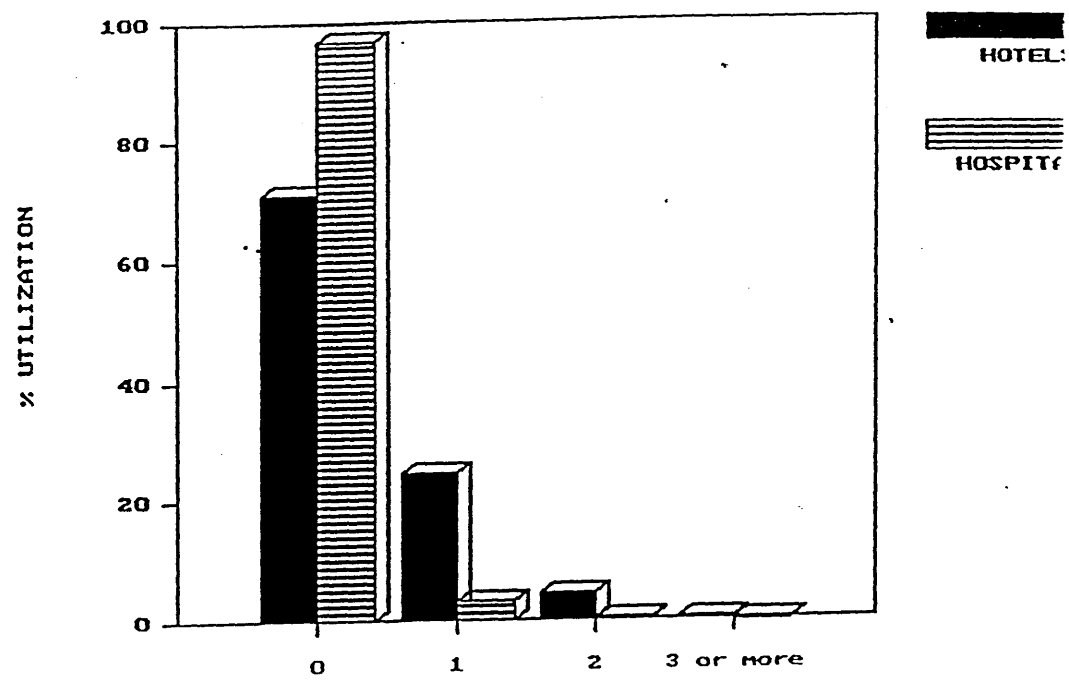


Figure 1 - NO OF VACUUM PACKER

TABLE 21 - VACUUM PACKER - % Utilizing one or more

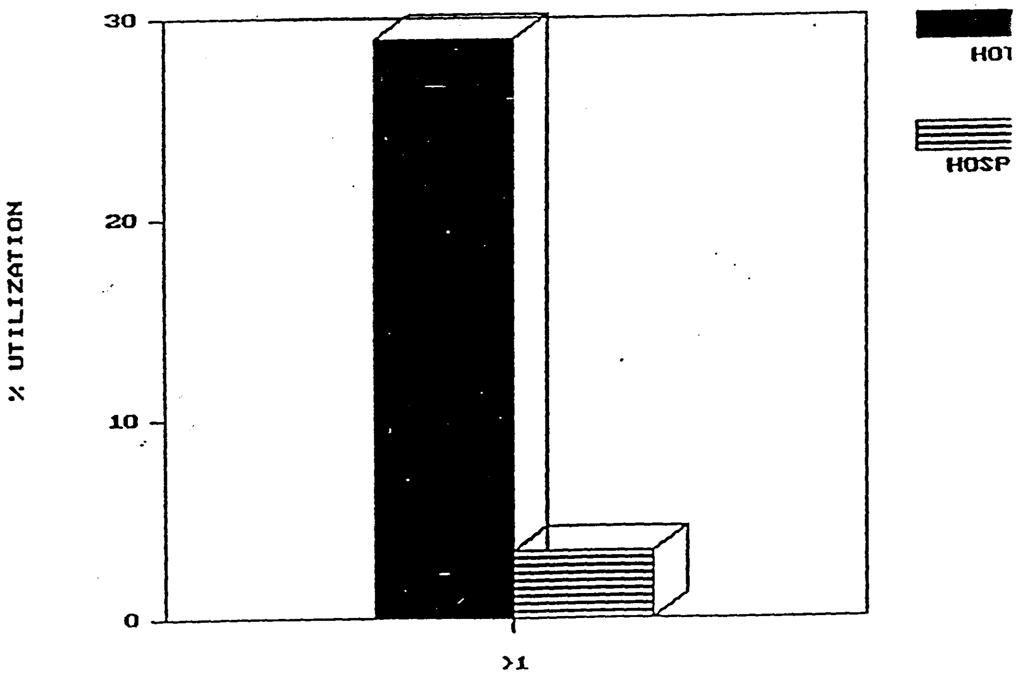


Figure 2 - ONE OR MORE VACUUM

TABLE 21 - VACUUM PACKERS

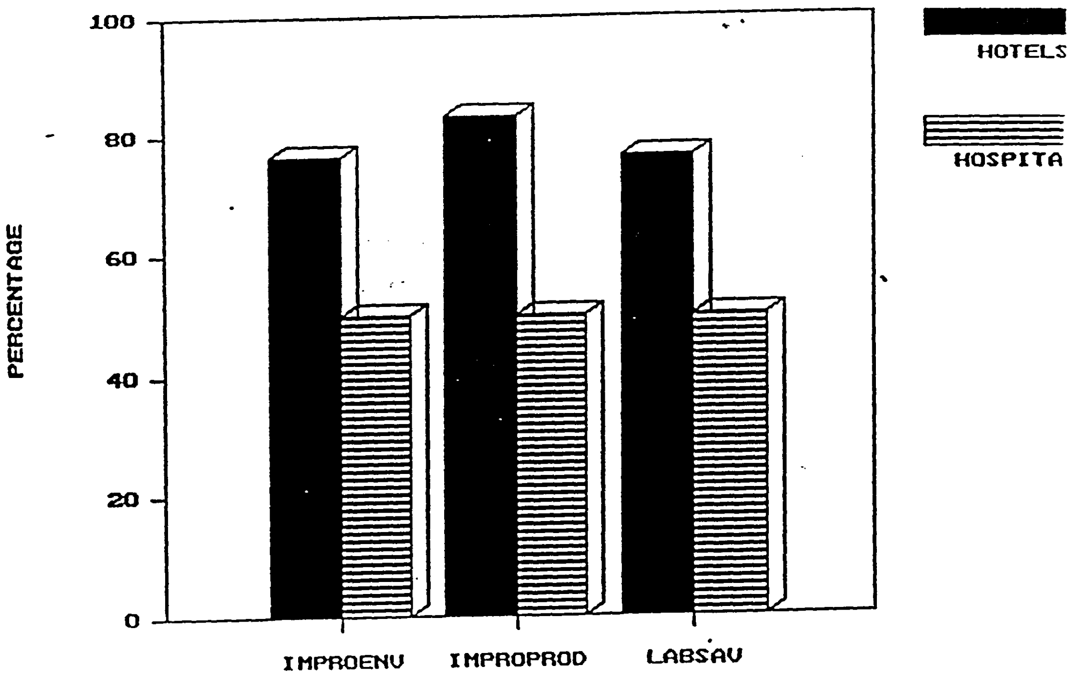


Figure 3

KEY

IMPROENV	- Improve environment
IMPROPROD	- Improve productivity
LABSAV	- Labour saving

INDUCTION HOBS

Figure 5.1 Row 22 (Source Table 22)

Overall Utilisation

The research shows that very few induction hobs are being used. (22% of hotels and 5% of hospitals use them). This is possibly because of the cost of this appliance, (minimum £2,000 per unit). Only the hotels who have converted complete kitchens to electricity, for example Brown's Hotel, or the BAFTA kitchen ('Hospitality' Nov. 1990) appreciate the benefits of lower fuel consumption and the speed of cooking obtained from the induction hob. The hob can be switched on all day, but until a saucepan is placed on it for cooking, no electricity is consumed. One disadvantage is that special saucepans have to be purchased to conduct the heat. Research carried out (Symington 1990) shows that 49% less energy is used by induction hobs than by traditional electric hobs, and for á la carte dishes the saving on energy consumption can be as high as 64%. As the hob heats only the pan, there is no surrounding heat loss, which also reduces the pressure put on the ventilation systems. From this research, it would seem more advantageous to have several induction hobs, to save on energy consumption, despite the initial cost; long-term, they are more economic (Brown's Hotel expected the pay-back period to be only two years). However, fewer hospitals have more then two, possibly because of lack of resources for the capital outlay.

Reasons for Utilisation

1. Improve environment

The survey shows that 82% of hotels and 80% of hospitals report an improvement. Both emphasise the benefits to the working environment for the chef. (This is corroborated by the head chef at the National Theatre's all-electric kitchen (Symington op. cit) pointing out the 'lack of heat coming from the hobs created a cooler working environment'. After close monitoring, the Electricity Council reported that the electrical load for this fully-installed kitchen - including refrigeration, dish washing, lighting and cooking equipment - was 170 KW. The old kitchen has the equivalent of 350 KW for gas cooking alone). This must be considered for future 'green' issues. During the course of research for this survey, it was observed at Brown's Hotel that the cooking system is extremely clean and efficient, and can be used for batch or á la carte service.

2. Improve productivity

64% of hotels, 40% of hospitals in the survey state that induction hobs improve productivity. It seems that the skilled chef finds the induction hob more generally acceptable, compared with traditional gas cooking. (This hob also eliminates bad habits, such as leaving sauces to reduce down or evaporate on the side of the stove, necessitating remaking the sauce, or re-thickening the item, thus using extra costly ingredients. With the induction hob, the saucepan has to be directly over the source of heat to allow the cooking process to proceed).

Hospitals which only have one induction hob in use, alongside solid-top gas stoves, cannot easily assess an improvement in productivity, unlike those hotel kitchens which have a full conversion to induction cooking.

3. Labour saving

The figures shown on the survey are 59% of hotels and 40% of hospitals. This is difficult to assess. As with any new product, it needs further testing, but certainly the hotel users state the advantages. Again, establishments not fully converted to induction cooking would not reap the full benefit of cleaner, cooler production cooking. A good working environment has to be labour-saving, as it results in less stress for the chef, who has more energy to achieve the high standards necessary for the Industry. With the conventional solid-top gas hob, the excess heat generated results in fuel loss, and the chef ends up as hot as the food (and the fiery temperament of overheated chefs can contribute to the high turnover of staff).

TABLE 22 - INDUCTION HOBS - Comparitive Utilization

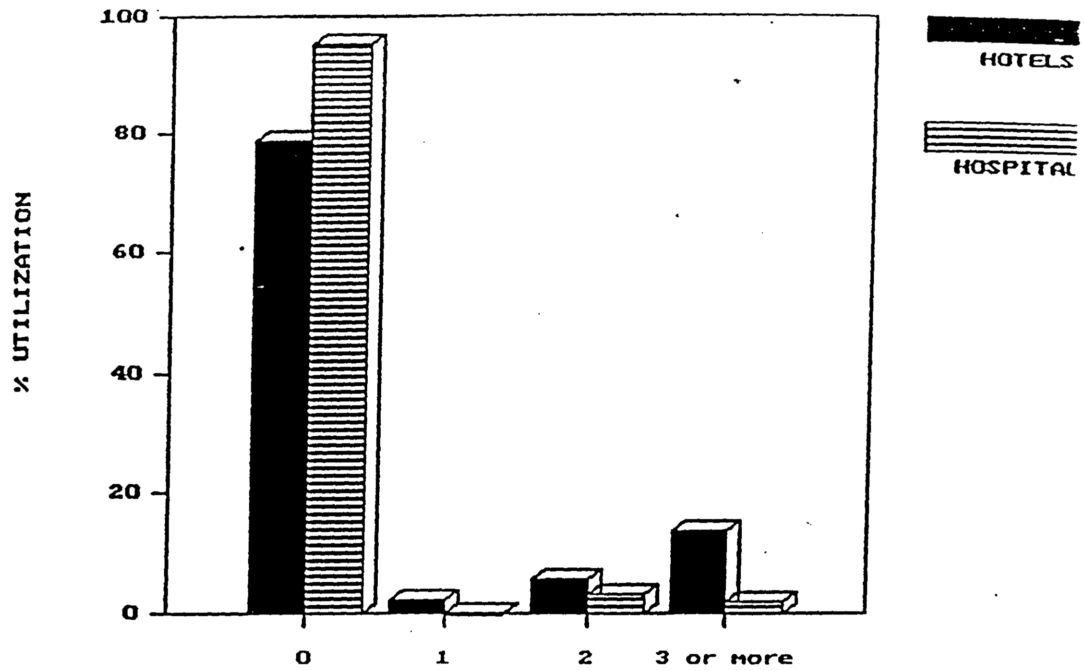


Figure 1 - NO OF INDUCTION HOB

TABLE 22 - INDUCTION HOBS - % Utilizing one or more

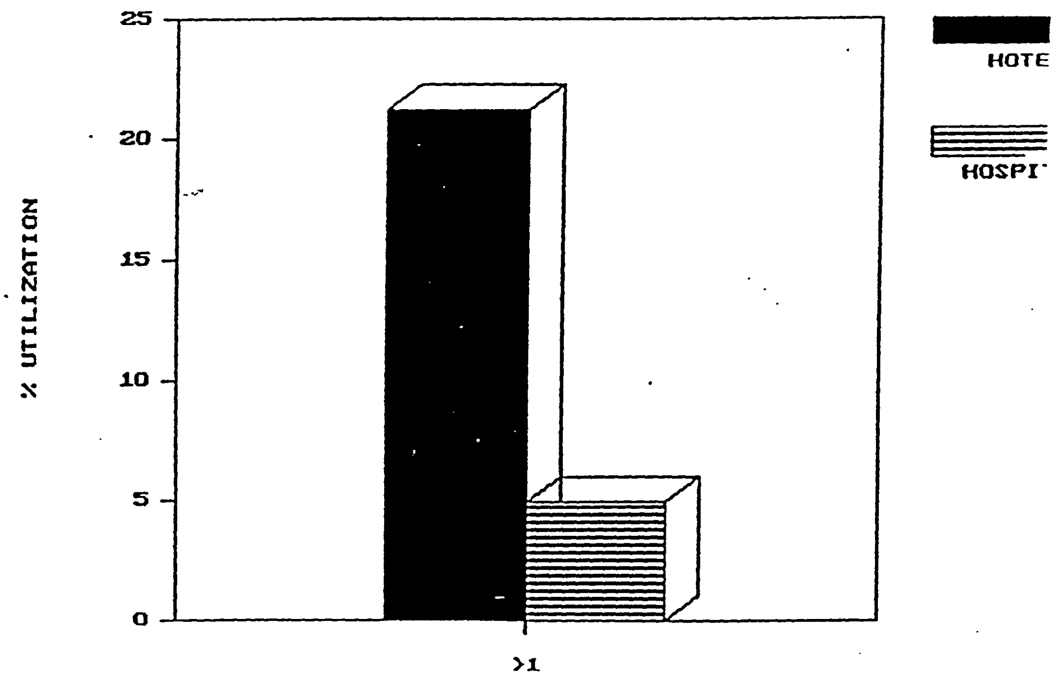


Figure 2 - ONE OR MORE INDUCTI

TABLE 22 - INDUCTION HOBS

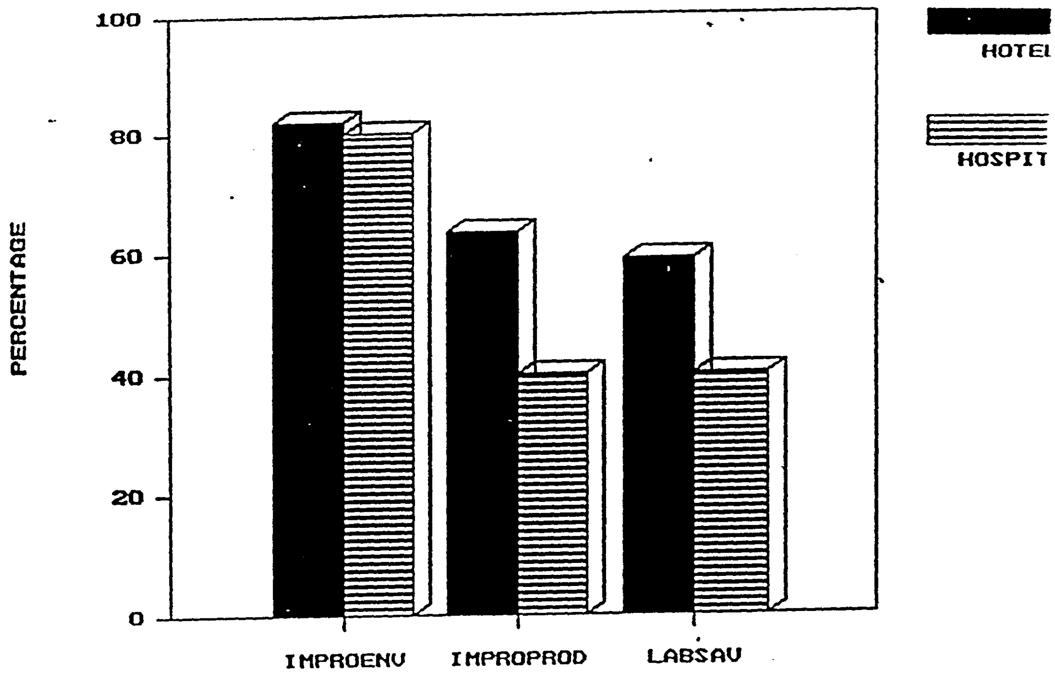


Figure 3

KEY

IMPROENV - Improve environment

IMPROPROD - Improve productivity

LABSAV - Labour saving

HALOGEN HOBS

Figure 5.1 Row 23 (Source Table 23)

Overall utilisation

The survey shows that at present, users of halogen hobs are few: Only 8% hotels and no hospitals in the survey use them; no doubt because they are a recent innovation, and because of the cost, since to obtain full benefit, a total refurbishment of the production or finishing kitchen is desirable. Although the hobs can be added to present operations, there is a loss of potential benefit. The main advantage of the halogen hob is that it is energy-saving and has a rapid heat conduction response. Research has shown it to be twice as efficient as gas. Salford University (June 1990) has carried out tests on boiling eight pints of cold water

Using gas	- boiled after 18.8 mins.
Using electric plate	- boiled after 13.7 mins.
Using halogen hob	- boiled after 9.6 mins

But the Halogen hob is still in its infancy, and although great interest is shown in this hob at catering exhibitions, it is still an expensive product. Although it has been proved to save on energy costs, the catering industry is a traditional and cautious enterprise, and the complete refurbishment of a kitchen is rarely seen as essential.

But this has to change, with an increasing number of catering units losing their subsidies (for example School Meals). Savings must be made, and the use of versatile and energy-saving equipment, such as the Halogen hob will be of prime benefit in this capacity. Once the price is reduced, the Hotel and Catering Industry will eventually invest in them as a means of saving on resources.

Reasons for utilisation

1. Improve environment

The survey shows 61% of hotels using Halogen hobs (there are none in use in the hospitals surveyed), agree that cooking heat is greatly reduced; this piece of modern technology has to be an asset for the future of catering, with speed of cooking, saving of energy and ease of cleaning, contributing to a better working environment.

2. Improve productivity

The survey shows that 49% hotels report improvement. Demonstrations observed and personal use have provided evidence that this apparatus has the benefit of easy control and the visual indication that the power is on, as the ceramic hob is illuminated when in use. One advantage over induction hobs is that there is no need to replace saucepans in current usage, which is a bonus to many chefs who favour particular saucepans for specific dishes; this also saves costs. Certainly the speed of cooking generated by the fast output of energy is a definite advantage to the customer, especially for cooking taking place in front of guests or on the servery.

3. Labour saving

The survey shows that 38% of hotels consider this to be labour-saving. The result suggest that the Halogen hob is not markedly labour-saving when compared to an ordinary solid-top stove, as the complete process of producing food requires similar input from the user. But there **are** labour-saving attributes, for example the heat produced by Halogen hobs is negligible compared to that from an ordinary stove, and the user's fatigue and work stress are thus greatly reduced, which could alleviate the problem of staff turnover within large production kitchens. There is the additional advantage of an easily-cleaned ceramic top, which is certainly labour-saving, and a further asset is the convenience of being able to utilise familiar saucepans - often a matter of some importance to chefs.

TABLE 23 - HALOGEN HOBS - Comparitive Utilization

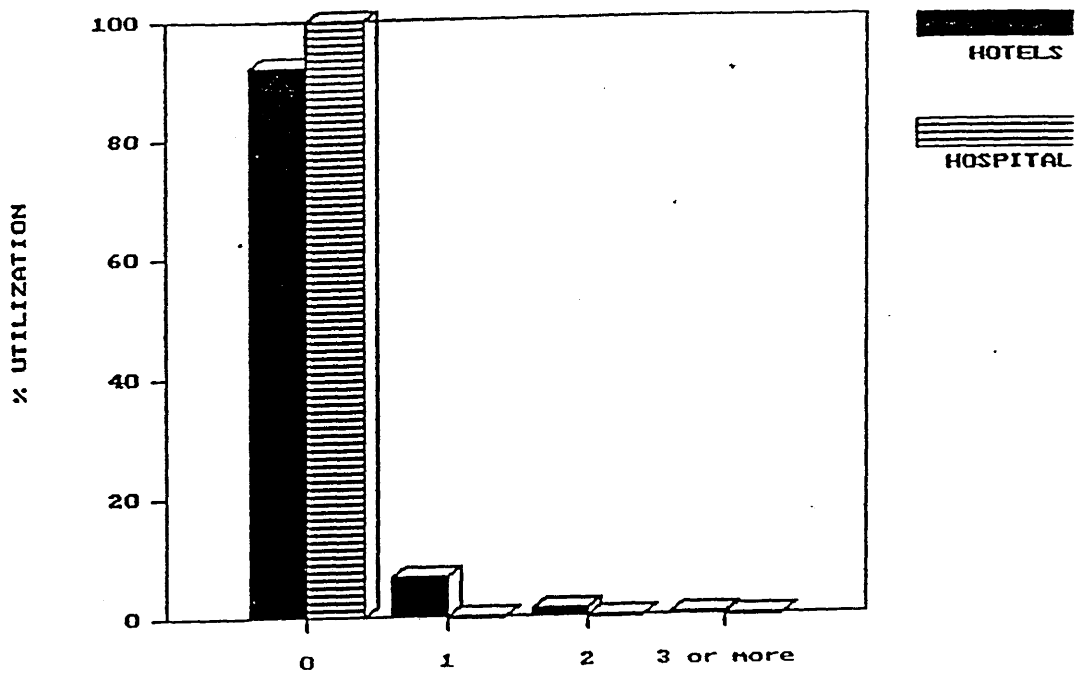


Figure 1 - NO OF HALOGEN HOBS

TABLE 23 - HALOGEN HOBS - % Utilizing one or more

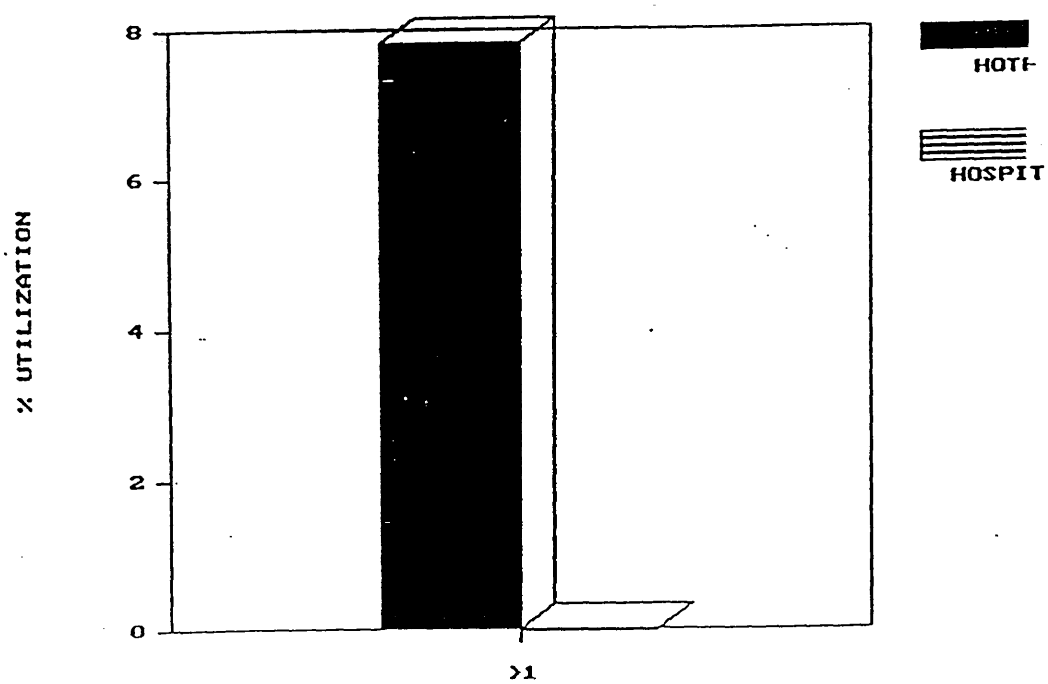


Figure 2 - ONE OR MORE HALOGEN

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TABLE 23 - HALOGEN HOBS

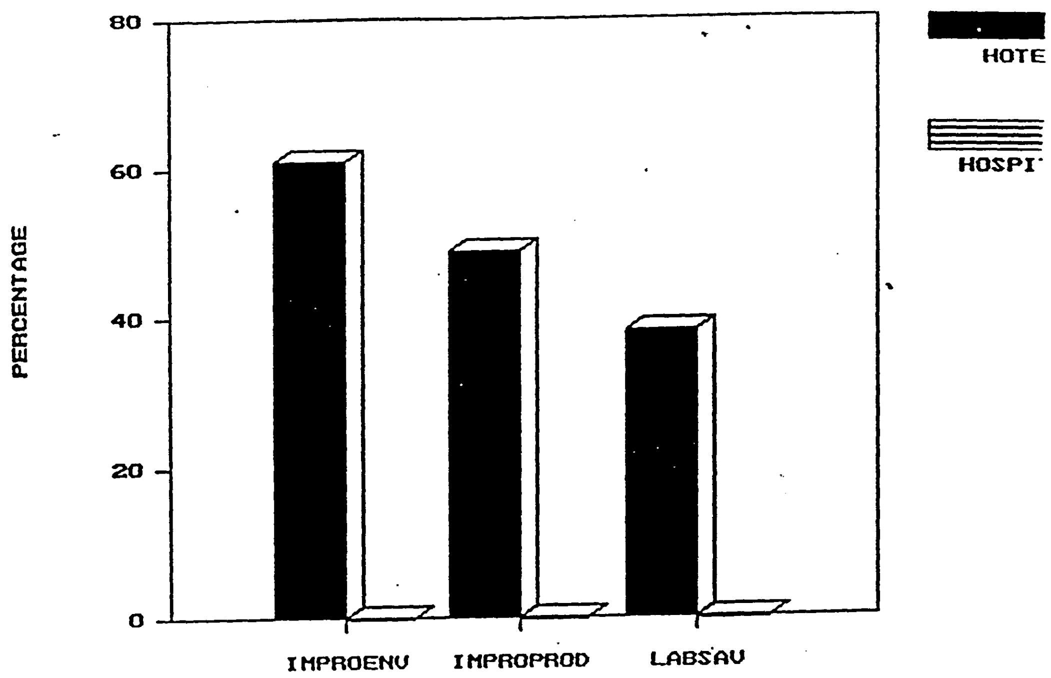

Figure 3

<u>KEY</u>

IMPROENV	**- Improve environment**
IMPROPROD	**- Improve productivity**
LABSAV	**- Labour saving**