AN EXPLORATION OF PROCESS VARIABILITY AND ITS MANAGEMENT: A CASE STUDY OF FOUR STAR HOTELS

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Abstract

This thesis suggests how service operations that experience arrival time and process duration variability can configure resources and design processes so that a throughput time appropriate for customers is maintained. It does this by exploring four star hotel operations, an under-researched area and uses observation, an under-used research method, to identify causes and reasons for variable throughput time. Several theories are brought together in a unique way to categorise and analyse the findings. The conclusion is that four star hotels can focus on reducing variability arising from their actions but that customer variability generally needs to be accommodated.

Customer variability is accommodated by using flexible capacity in the form of labour, space and equipment. Service encounters are shortened to allow employees to process customers more rapidly when demand is high. Physical space to contain customers is provided to allow them to exercise choice as to the length of time that they spend on activities. Labour is flexible and cross-trained; moving labour to satisfy demands of customers present is a key operational aim in hospitality. This is supported by ensuring that sufficient equipment and materials are provided to meet the needs of customers. Future research could be conducted to investigate approaches to influencing customer variability while maintaining perceived satisfaction with service.

The findings reveal useful insights for operations that experience variable arrival and processing rates. People are the greatest source and least controllable source of variability. It also confirms the utility of some key operations and service management theories.

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CHAPTER 1: INTRODUCTION

All operations experience variability (Slack, 2012). Variability affects throughput rates and can lead to increased work-in-process. In service organisations the work-in-process is often customers. Generally customers have a limited tolerance for waiting and excessive waiting can adversely affect customer satisfaction. This thesis focuses on hotel operations and reveals how some hotels are configuring their resources and processes to cope with variability in customer arrival and processing rates. It explores how to efficiently and effectively manage capacity in services to cope with uncontrollable variability in arrival and processing times.

This thesis adds to knowledge by revealing the extent and type of customer variability at the front desk and breakfast. Different types of variability dominate in each situation requiring different approaches to resource configuration and process design. This thesis reveals how hotels configure their resources and processes to efficiently cope with variability while, generally, avoiding unacceptable waiting times for customers.

Chapter 2 introduces the Process Management Triangle, based on Little's Law (Klassen & Menor, 2007), to show the link between the level of inventory, variability and capacity utilisation. Basically a change in any of the three will have an effect on at least one of the others. This principle underlies the thesis; the processes examined experience great variability, customers are inventory and need to flow at a rate acceptable to them, to do this there needs to be spare or flexible capacity to absorb the changing volume of customers in the system. The chapter then explores key concepts such as time, variability and capacity.

Capacity consists of time and tangible resources such as facilities, equipment and people. Every event consumes time and everything is in process and the outcome of process is change. The concept of process is explored in depth with processes being viewed as causal mechanisms. A conceptual model is presented that represents the causal links between the causes of variability and the main principles that can be applied to cope with it.

Chapter 3 discusses the methodology and the methods used in the field. Managers have a tendency to be pragmatic (Lundberg, 2004), they want to know how to achieve goals. Pragmatism is about problem solving, about learning from experience and can be seen in principles such as continuous improvement (Calaveri, 2008). Critical Realism, as expounded mainly by Sayer (1992) adopts a pragmatic view of knowledge and is used to justify an intensive research design. The case study research strategy, as described by Yin (2009) is used to justify research methods and approaches to analysis. Most of the data is collected by observation and supplemented with short interviews and documentation. Observation is highlighted as an infrequently used method in business research. Case studies of hotel practice also rarely appear in journals.

Chapter 4 sets out quantitative and qualitative findings. Quantitative data about throughput time was collected and analysed for check-in and breakfast service. Great variability in arrival and throughput time was observed. As well as recording timings observations recorded observable causes of throughput time. These were supplemented with questions to staff and short interviews. Observations are used throughout the findings and analysis chapters to provide examples of causes of delay and activities that reduced throughput time. Customers were not questioned, only observed behaviour was recorded.

There was clear evidence that the breakfast process was almost completely self-service, service encounters were very brief, there was little waiting for service, and employees were there mainly to serve beverages and clear tables. Customer time was spent either selecting and consuming food or passing the time in other activities. Physical capacity was limited, self-service and the randomness of arrival times was relied on to maintain throughput. High task variety remained at the front desk requiring staff to have a wide knowledge. Flexible labour and task engagement were the main tactics used to cope with variable demand. Staff would save up tasks or engage in tasks that did not require the presence of customers when there was no customer demanding service. Customers occasionally had to wait for service but, once at the front desk, were actively engaged with an employee throughout the process.

While some variability was due to the system, customer variability was the most significant source of variability in the processes observed. Chapter 5 applies Frei's (2006) categorisation of customer variability and highlights that request variability dominated at the front desk and subjective preference variability at breakfast. The two processes are then analysed to judge the extent to which they have the features expected by the categorisation models of Schmenner (1984 & 2004) as modified by Slack et al (2009) and Johnston et al (2012), generally they were both judged to fit the service shop category but front desk has some features of a professional / capability service while breakfast has some features of a mass / commodity service. Principles to manage capacity (Pullman & Rodgers, 2009) and throughput time (Anupindi et al, 2012) were summarised and set out in table 5.10 and evidence for their application assessed.

Chapter 6 states the main contributions of the thesis for theory and practice and reviews the aim and objectives to assess the extent to which they have been achieved. The main contribution to practice is a measurement of the extent of variability in arrival and processing times and the confirmation of principles that can be applied to accommodate this variability while remaining efficient.

The key contribution to theory is confirmation of the utility and validity of a range of operations and service management theories. Evidence from practice is presented of how resources and processes in services are being configured to accommodate variability in customer arrival times and process duration. The Process Management Triangle places a focus on the role of flexible and spare capacity in variability accommodation. Interaction frequency and duration is reduced, this both improves efficiency and the ability to accommodate variability. The drive for efficiency is moderated by the requirement to satisfy the emotional needs of customers for social interaction and control of service duration.

1.1: BACKGROUND TO RESEARCH

The aim of this introductory section is to “set the scene”, to position and justify the research topic in relation first, to operations and service management literature and then to the study of hospitality operations. It introduces the strands of theory that have been brought together to address the basic issue of coping with variability in arrival and processing rates and situates them in the context of managing hotels.

Operations and process management is about managing the resources and processes that produce products and services (Slack et al, 2009). Essentially this thesis conceptualises the research problem using concepts and theories from the field of operations management. This views organisations as systems of overlapping processes that employ resources to transform inputs into outputs. Jones et al (2003) adopted a similar approach to hospitality operations. Resources and processes have the capability to do things. If hotels can reduce waiting time for customers for little or no additional cost then it may be a contributory factor to the satisfaction of customers. Activity consumes time, this thesis explores how four star hotels are removing time from activities and flexing their resources to cope with the variability in customer arrival and processing times.

The origins of operations management theory are not clear. Voss (2007) traces western sources back to a text on mining and metallurgy published in 1556 which discusses the activity as a continuous flow process. Scientific management is generally thought to have been formalised with the work of Taylor (Voss, 2007) and his 1911 publication of the principles of scientific management. The scientific approach to management continued to dominate in the 1940s and 50s with management often being referred to as a science (Chopra et al, 2004). Levitt (1972) highlighted the growth of services and urged operators to follow the lead of companies like McDonald’s and apply techniques found in manufacturing. At the same time Ohno and others were developing new approaches to manufacturing, most famously, in the Toyota factories of Japan. Ironically Ohno (1988) claims that the ideas behind the Toyota Production System are actually based on the writings of Henry Ford. In the late 1980s, following the publication of books such as that by Ohno (1988) and Womack et al (originally 1990) researchers rediscovered the role of time in manufacturing.

In 1991 Blackburn, as editor, published a book about time-based competition in manufacturing. Blackburn asserted that customers were demanding increasing variety and wanted fast delivery. Speed from order to delivery was being recognised as a competitive advantage for some industries, the apparel industry for example. Japanese manufacturers were good at this, most American manufacturers focused on cost and quality (Blackburn, 1991). The orientation of production to remove time used ideas coming out of research in Japan, such as Just-In-Time (JIT), reduction of set-up time, reduction of work-in-process and waste elimination. Schmenner (1988) suggested that the key was to keep things moving rather than work as fast as possible, productivity can be achieved through smooth even flow (Schmenner, 2004), this is partly achieved by reducing the duration of employee interactions with customers. Suri (1999) put forward his ideas as Quick Response Manufacturing (QRM). Blackburn and Suri make reference to the publication on Industrial Dynamics by Forrester (1958). QRM moves beyond Lean and Six Sigma (Suri, 2010) because it makes the distinction between desirable and undesirable variability. Achieving quick response is mainly a matter of company mindset and organisation. The ability to offer variety and customisation needs to be retained as it can be an advantage in small companies, spare production capacity is desirable because it can be used to accommodate variability. Labour costs in manufacturing are a small proportion of total costs. QRM tackles the overhead and inventory costs (Suri, 2010).

The lean paradigm is better suited to level production, manufacturers that experience fluctuating volume and variety of demand may benefit by adopting the agile paradigm (Naylor et al, 1999). Agile Manufacturing is the capability of the manufacturer to quickly respond to market requirements (Ramesh & Devadasan, 2007). Agility is also related to principles of lean and time-based competition. It focuses on postponing product differentiation in the supply chain. The key idea is to have a limited range of products that can be quickly customised in response to customer demand. This is very similar to mass customisation in which processes are agile and the output flexible (Jones et al, 2003), Suri (2010) argues that manufacturing can achieve this by reorganising to speed the flow of orders through the system. A frequent example given is Benetton and its change from making jumpers from dyed wool to dying jumpers in response to demand for colours (Naylor et al, 1999). This is, essentially, what quick service and fast food restaurants do; they stock a limited range of items that can be quickly assembled in a variety of ways. Indeed this notion could also be extended to the breakfast buffet. The idea is to be able to respond to demand variability while reducing the inventory of finished goods, some of which may prove unpopular and remain unsold.

While manufacturing was developing systems responsive to variable demand, service companies, such as McDonald's were highlighted as 'trailblazers' in time reduction by Blackburn (1991). In 1972 Levitt was using McDonald's to illustrate the application of industrial principles to what was seen as a service and commented that there are no such things as service industries, all industries offer some services; it is a matter of degree (Levitt, 1972). He advised that, to improve efficiency and quality, services need to apply technocratic thinking to service design. Being efficient is related to productivity, efficiency can be viewed as addressing mainly the inputs as a proportion of the outputs (Tangen, 2005). Chase (1978) argued that the extent of customer contact is the key factor that sets limits to how efficient a service operation can be. He defines the extent of customer contact as "the percentage of time the customer must be in the system relative to the total time it takes to serve him" (Chase, 1978;138). In high contact systems, such as hotels and restaurants, the customer can affect the timing, nature and quality of service. Capacity and demand are in balance only by chance, delays and customer input leave high contact systems "at the mercy of time" (Chase, 1978;140). Chase suggested that control could be improved by moving as many tasks as possible to the back office to remove the influence of customers. Fitzsimmons (1985) argued that, rather than being a hindrance to productivity, the customer should be viewed as a productive resource that can contribute effort in the service process. Customers create the demand for service by their presence and thus arrive just at the right time to carry out some of the tasks themselves.

According to Heineke and Davis (2007:365), "Prior to 1970, no business schools offered courses that focused on services; there were no textbooks on services; there had been no research conducted on services." Levitt, Sasser, Chase and Fitzsimmons are cited as influential writers of the 1970s. Johnston and Clark (2012) remark that there is no agreed definition of what a service is. Generally it is an activity in which the output or outcome is intangible. Vargo and Lusch (2004) define services as "the application of specialized competences (knowledge and skills) through deeds, processes and performances for the benefit of another entity or the entity itself".

A key difference between activities that manufacture and services is that services cannot be created and stored in advance of their consumption (Fitzsimmons and Fitzsimmons, 2011). Operations management theory has its roots and development in manufacturing and has a tendency to assume that the customer has no role in production and that human labour can be viewed largely as controllable and mechanical. Service operations texts (for example

Johnston & Clark 2012; Fitzsimmons & Fitzsimmons, 2011) take account of the properties of the customer. The customer is conscious, emotional and self-reflective and does not view themselves as a unit of production but as a person using the operation for their ends, for the satisfaction of some customer need.

Service cannot be stored and are frequently delivered with the customer present as a co-producer (Vargo and Lusch, 2004). Service providers therefore need employees to be responsive, to make necessary adjustments (however minor) to the contents and pace of the process so that the customer gets what they want. Sometimes a service process requires guidelines rather than an inflexible procedure (Jones et al, 2003). Service delivery in many circumstances is not of a fixed duration, the smooth flow desired by operators (Schmenner, 2004) is largely unachievable. When the customer co-produces the service the pace and duration is greatly influenced by customer choice rather than being decided by the organisation.

Responsiveness is one of the five dimensions of service quality (responsiveness, reliability, assurance, empathy and tangibles) identified by Parasuraman et al (1985) and is still considered so today (Johnston et al, 2012). It is defined as the willingness to help customers and to provide prompt service (Fitzsimmons & Fitzsimmons, 2011; Wilson et al, 2008).

Operational responsiveness is defined in Wu et al (2010:729) as "the differentiated skills, processes, and routines for reacting quickly and easily to changes in input and output requirements, so that a process can consistently meet customer requirements with little time or cost penalty." This definition is drawn from a study by Swink et al (2005) that defines flexibility as "the demonstrated ability to adapt or change plant-level operations with relatively little time or cost penalties (p. 432), being responsive therefore means having operations that have flexible resources that can be deployed at short notice. If maintaining prompt service under conditions of variable demand is a problem for managers and prompt service is a contributory factor in customer satisfaction then investigating how this operational capability can be achieved is worthwhile.

Being responsive means configuring processes and resources so that customers can pass into and through the process at an appropriate speed. In the context of this thesis appropriate speed refers to the activity duration chosen or regarded as acceptable by the customer. If the service is delivered without scheduling it also means that the operational system needs to be able to quickly adapt to short term changes in demand. If an operation adapts consistently with little time or cost penalty then it may have developed an operational capability that delivers an advantage.

The hospitality industry is a service industry, it provides food, drink and accommodation away from home (Davis et al, 2008), whereas a hotel is "an operation that provides accommodation and ancillary services away from home" (Jones & Lockwood, 2004:1). Hotels are a mixture of tangible facilities and products and intangible services. Some processes are more like manufacturing, such as food production and housekeeping where, although work is initiated in response to customer demand, the customer plays little direct role in the activity. Services and products are consumed on the premises and, generally, the customer takes nothing tangible with them when they leave, except perhaps a few toiletries!

Hotels can be viewed as systems (Jones et al, 2003; Tesone, 2010) and principles of service and operations management applied to the analysis of those systems (Jones et al, 2003). Principles developed in the study of service and operations management can therefore be applied in hotel operations. In this thesis customers are viewed as flow units in a system, they occupy time and space and thus conform to physical laws. Products and services are created in response to customer demand. The customers are less uniform or controllable than products. Customers are co-creating value for themselves and thus have an input into each process. The behaviour of customers therefore introduces variability into the duration of activities within the system. This time variability, in process and arrival rates, results in a system with an uneven flow. This can result in periods when the number of customers demanding service is higher than the system can cope with, and periods when the system has lower demand than it is capable of processing. When demand is high, or rather when the effective capacity of the system is highly utilised, customers are forced to wait for service. This thesis explores how hotels can configure resources and processes to cope with this variability so that customers wait for service less frequently and for less time.

Given the vast number of hotels and the number of people that use them it could be expected that hospitality operations are a focus for researchers. A search of the EBSCO Hospitality and Tourism database returned only 128 peer reviewed articles containing the words hospitality, process and improvement, this reduced to 32 when the word hotel was substituted for hospitality. There were even fewer focussing on the delivery of hotel operations. There were no articles investigating the relationship between variability and process design in hotels or restaurants.

Service and operations management books, such as Fitzsimmons and Fitzsimmons (2011) and Slack et al (2010), introduce queuing models and discuss the impact of variability on throughput time, Maister's (1985) psychology of waiting lines is also frequently mentioned. Hospitality management textbooks generally mention the importance of service speed and the unpredictability of customer arrivals (for example, Jones et al, 2003; Jones & Lockwood, 2004; Kasavana & Brooks, 2005; Davis et al, 2008; Lillicrap & Cousins, 2010) but do not investigate the extent or sources of variability, or the impact of variability on throughput time. Following from this there is little advice as to how resources and processes can be arranged to cope with variability and reduce the likelihood that customers will be kept waiting. There is therefore, arguably, a gap in the provision of useful knowledge to hospitality operators.

Some journal articles have explored customer satisfaction with waiting time in meal service (Hwang & Lambert, 2009; Sheu et al, 2003; Hensley & Sulek, 2007). Noone (2007 and 2009) explored how meal pace affected satisfaction. Noone (2010) also supplied the only study on the check-in process. It is uncontroversial to state that hospitality customers have a limited tolerance for waiting on most occasions. It is likely that most people who stay in hotels even occasionally have been required to queue at the front desk or entrance to the restaurant. There are many alternative hotels for customers to choose from (Barrows & Powers, 2008) and if reduced waiting time can be assumed to be a small factor in customer evaluations then examining ways to reduce actual or perceived waiting time for customers is worthwhile.

Some research has been published in relation to capacity management and productivity in commercial restaurant brands. Sill (1991, 1999, 2004, 2010) developed an approach to managing capacity that he calls Throughput Capacity Management, the approach aims to achieve faster and more consistent order to delivery times for quick-service restaurants (Sill, 2010). Kimes (2004) reported on a study to improve the management of revenue at a midscale Mexican-style restaurant. Changes were made to layout, process design and employee roles, essential capacity, that resulted in improved capacity utilisation and throughput time.

As already indicated, a focus of this thesis is on time. One of the interviewees commented “most things relate to speed”. Delivering service promptly and minimising the wait of customers is a basic requirement of managing operations successfully. Activity consumes time and it is the perspective on time that is discussed in Blackburn (1991), Seddon (2005) and Suri (2010), for example, that provides a different perspective here for the analysis of hotel operations with the aim of improving efficiency and effectiveness. Put simply, it is about removing service encounter time, reducing the interaction between employees and customers. This spreads the labour cost among a greater number of customers. The short interaction time means that, if customers are required to wait, perhaps due to an increase in the arrival rate, then their wait is likely to be brief.

In summary, activity consumes time and the objects being acted on occupy space. Process improvement is partly about identifying resources and activities that add cost but no value. By removing them throughput time is also reduced, this increases the capacity to produce. In some services, such as hotels, customers co-create value and this can require them to occupy space in the operation while they create value for themselves. The fundamental question to be addressed here is; how do hotels efficiently cope with variable arrival and processing rates and avoid unacceptable waiting time for customers?

1.1.1: The Aim

The overall aim of this study is to explore what theory says about how resources and processes can be configured to achieve appropriate throughput time or to quickly adapt to cope with short term increases in demand and to investigate the actual tactics used in hotels.

It is expected that different solutions have been invented for similar problems and it is hoped that the research will identify sets of conditions that hoteliers can create to improve their ability to achieve appropriate throughput time in different contexts.

The main research aims are therefore as follows:

1. To explore literature to review appropriate research and theories about how resources and processes can be configured to:

    a. Achieve appropriate throughput, and

    b. Make short term changes to effective service capacity to cope with short term peaks in demand.

2. To explore literature to identify preconditions to achieve the above. The objective is to suggest the necessary and contingent conditions that increase the likelihood that 1a & 1b will occur.

3. To select and investigate a number of mid-market, full-service hotels to identify the actual tactics used to achieve the above.

4. To discuss the findings in relation to theory derived from previous research.

5. To conclude and make recommendations for appropriate resource configurations to apply that are likely to lead to appropriate speed of service.

This research topic has been selected for a number of reasons. The researcher has had connections with hotels all of his life, after being a manager of a fifty bedroom full-service mid-market hotel for a number of years he is now a lecturer in hospitality operations management and wants to explore a topic relevant to his experience and work. Many ideas have been explored and rejected, some were too complex for an individual researcher with very limited time, others seemed to lead towards marketing or strategic management issues, or seemed more suitable to a quantitative approach. Thinking back to his days as a manager his experience indicates that, whilst quantitative methods are very useful for the analysis volumes and values and for pointing to the possible presence of a problem, they uncover very little about the causes of a situation. At this point the manager needs to start analysing the processes and resources to make sense of the event, to uncover a probable explanation for it.

The concept of a full-service, mid-market hotel is applied loosely, it is simply meant to refer to the concept of somewhere that provides accommodation, food and drink that is considered by most customers at neither extreme of budget or luxury. Based on UK standards this is intended to include hotels awarded four stars by the AA (Automobile Association) or RAC (Royal Automobile Club).

According to the Hotels –UK – 2012 report (Mintel) 150 million nights were spent in UK hotels in 2011 and research indicated that a little over 40% of leisure and business customers stayed in four star hotels. There is no international classification of hotel standards, each country, develops its own classification, as do tour companies such as Thomson and FirstChoice. The Automobile Association (AA) started inspecting UK hotels in 1912 (theaa.com) and, until recently, the AA and RAC were the only UK wide common standards. According to the AA (www.theaa.com) there are 14 four star hotels in Birmingham. Four were visited by this researcher.

The focus is on time from the customer's point of view, this includes both chronological and perceived time. Consideration will be limited to occasions when the customer is on the premises either waiting for or experiencing service. Whilst a passing consideration will be given to objects and conditions within the structure and infrastructure of the organisation that affect process speed research will concentrate on what is within the control of the departmental manager, supervisor, employee or customer.

Four star hotels were chosen for this study for several reasons. They are neither budget nor luxury and are thus seeking ways to maintain high levels of service but at reduced cost. They are branded hotels, it was assumed that they would employ better educated and trained employees, and may have examples of suitable good practice. Finally, for convenience; there are 14 four star hotels within easy travelling distance of the researcher's base. It will be argued however that there are necessary properties of people and activity that mean that the principles of process design applied have relevance for all operations faced with variable arrival and processing rates.

It was decided to examine two processes to contrast that are observable and directly involve customers. All customers check-in or check-out and many more have breakfast than dinner hotels. Breakfast service and check-out overlap in time so it was decided to focus on check-in and breakfast. The researcher had previously observed and experienced unacceptable waiting time in these processes and considered that it would be of benefit to investigate what could be done to reduce unnecessary waiting time for customers.

CHAPTER 2: CONCEPTUALISATION OF KEY CONCEPTS

2.1: INTRODUCTION

This chapter will conceptualise the key operations management theories that lie behind this thesis. It will introduce the concept of the process management triangle as a framework that represents the relationship between variability and capacity utilisation. It will then explore the concept of time and capacity. The concept of the process will be explored in detail before moving on to consider variability. Finally it will present a causal framework outlining key principles for reducing or accommodating variability in a customer focused context.

2.2: THE PROCESS MANAGEMENT TRIANGLE

The concept that could be said to have inspired this thesis is the process management triangle and it is briefly considered here by way of introduction. Klassen and Menor (2007: 1016) stress “the continued relevance and urgency for greater managerial understanding of process management fundamentals”. The triangle highlights the causal interaction between the amount of variability, the amount of inventory in the system and the utilisation of capacity. It demonstrates why, if flow units are not to be kept waiting, there must be spare or flexible capacity in systems that experience variable arrival and processing rates. This thesis develops understanding of process management fundamentals.

Process contains events and events consume time. Little's Law, actually a tautology rather than a law (Little & Graves, 2008), states the relationship between flow time, throughput rate and inventory, if two are known then the third can be calculated approximately. The basic principle of the causal relationship between these factors is reflected in the Process (or Operations) Management triangle below (Klassen & Menor, 2007). The triangle asserts the role of variability of arrival and process time in changing the level of inventory in the system and thus the utilisation of capacity.

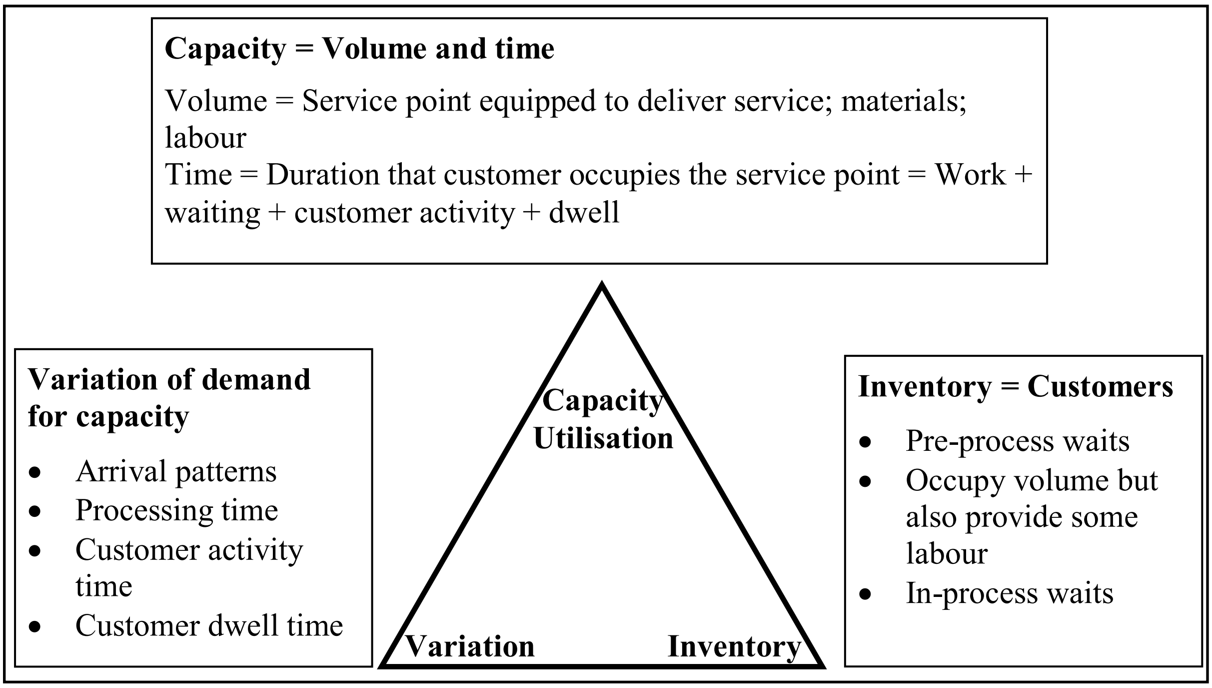

Figure 2.1: The Process Management, or Operation Management Triangle, adapted from Klassen & Menor (2006).

In the Process Management Triangle in figure 2.1 a change in one of the three factors tends to result in a change in at least one other. In this thesis inventory is customers and it will be assumed that the aim is to adjust the other two corners so that customers flow through the process at a speed that is appropriate for them. Where ‘buffering’ (queuing or waiting in line) of customers does occur it is to be viewed as an undesirable situation.

Variation in arrival time means that the arrival rate of inventory wanting to enter the process is lumpy rather than smooth. At times, therefore, the capacity of the system will be under-utilised or idle, at other times inventory (customers) may have to wait in line. Variation in activity time means that the volume of inventory in the system would vary even if the arrival rate were smooth. At times the resources of some activities in the process may be fully utilised and require flow units (customers) exiting previous activities to wait for service, activities downstream of this delay may then be under-utilised. The main flow units in a service are people, and people (unlike inanimate objects) experience the passing of time and have a limited tolerance for waiting. It can, however, be noted that some inanimate objects quickly degrade or spoil and so cannot be kept waiting. If the operation cannot smooth the arrival rate, and the inventory of customers cannot be buffered for long without generating dissatisfaction, then capacity must be manipulated to ensure that customers continue to flow at a rate appropriate to them. Smooth flow can never be achieved in systems where customers arrive at a time convenient for them and have varying desire or need for interaction with staff. This includes industries such as hotels, restaurants, retail, and telephone support services.

An underlying assumption here is that capacity is a cost and that a goal of managing operations is to be productive and efficient by minimising the cost of input resources. Capacity to contain and process must ‘breathe’ with rather than ‘chase’ after changes in demand. As the number of customers increases service staff have to share their labour among a greater number of customers, perhaps being forced to shorten service encounters and to give less attention to each customer. Physical capacity, like the capacity of a river system, is largely fixed and must be sufficient to contain demand on most occasions. Capacity to process is provided by labour and equipment, speed is determined by process duration and processing pace.

The importance of this simple causal relationship seems to be underplayed in most Operations Management literature (Suri, 2010). This framework summarises the operations view of the physical mechanisms that determine throughput time.

If process management fundamentals are to be understood then the key concepts of process, variability and capacity need to be explored in depth. Time, or activity duration, is a theme that needs to be discussed under the topics of capacity and variation. If the duration of an activity can be shortened, then effective process capacity is increased as more flow units can be processed with no increase in processing resources (Anupindi et al, 2012). The nature of variation means that it affects activity duration, therefore, reducing variation makes activity duration less variable, more predictable. Following from this units flow through the system at a more regular rate reducing variations in demand for capacity, higher rates of capacity utilisation can be achieved with reduced probability of queues forming or capacity being idle. A smoother, more even flow is achieved (Schmenner, 2004).

If waiting time (buffering) is to be eliminated then the processing capacity of the system needs to be flexible to both absorb the variation in inventory caused by arrival time and processing time variability and the varying time demands of inventory within the system. The two basic options are to maintain spare capacity or to have flexible capacity, that is, resources that can be either made available to, or removed from, the activity or process as demand fluctuates.

In summary, the Process Management Triangle is presented as way of illustrating the necessary relationship between time variability and capacity utilisation. As with time-based competition, the focus is on keeping inventory, in this case customers, to a level that maintains an acceptable flow time from the customers' point of view. The passing of time is experienced by customers and their experience of it needs to be appropriate to their needs, they need some control of process duration. This means that capacity, as the final corner of the triangle, must adapt to the variable demands placed upon it.

2.3: TIME

Chronological time is measured using clocks, it is an artificial construct and just one way of sensing duration (Davis, 1994). For most of the developed world everyday work and life is organised around chronological time. It provides an objective reference point around which activities can be organised; it also provides an objective measure of their duration. Without reference to a clock human assessment of time of day and duration is inaccurate and context dependent. Maister (1985) discussed perceived time and suggested that, generally, unoccupied time, or time when people are anxious, is perceived to pass more slowly than occupied time. If people are worrying or do not have something to keep their minds occupied then time seems to pass more slowly.

Chronological time is important in operations because it is a limited resource, activity consumes it and labour time is a direct cost. The lean approach wants to eliminate quality defects and remove waste partly because they both consume time that could instead be used to add value (Ohno, 1988). The identification and elimination of activities that do not add value so that throughput time can be reduced is the key to the concept of time-based competition (Blackburn, 1991: Suri, 2010). It is also assumed that items flow through the system in the order in which they arrive. Time spent waiting between activities does not add value and is a waste. For most service systems time spent waiting is regarded as a cost for the customer (Fitzsimmons & Fitzsimmons, 2011). Some operators, however, try and make waiting part of the service experience (such as theme parks) or provide activities (such as entertainment) to fill time, or generate additional income (such as a seat in the bar).

Services are time-bound experiences that are generated and consumed at a location. There are some enjoyable experiences that customers may say they wish to extend. There are also unpleasant or boring experiences that customers may wish to curtail. Customers are paying for an experience and hope for one that is pleasurable in consumption, or where it cannot be (such as surgery), the outcome is as hoped. Hensley & Sulkek (2007) investigated satisfaction with waiting time at different stages of the meal process and concluded that service entry (pre-process) waits are more important than in-process and post-process waits (bill payment and departure. Hwang & Lambert (2009) however conclude that customers like a faster pace post-process. Both studies agree that customers may choose to linger (dwell) and that meal service must be at a pace that is acceptable to customers. Customers may feel dissatisfied if they feel either rushed or delayed, perceived time was thought to be more important than chronological time (Hwang & Lambert, 2009). If customers are to be satisfied then it seems advisable for operators to let customers control the pace of consumption.

Services therefore need to give customers some control over the duration of their own experience. This thesis uses the term 'appropriate duration'; this means customers are generally permitted to perceive that they are deciding the duration of the experience within certain operational limits; or, if kept waiting, that waiting time is of an acceptable duration. It is a customer-centric view of process time in which the customer perceives that they are in control of the chronological time spent in each activity.

The role of the organisation is to deliver products and services within a time-frame that is set by the organisation. It is assumed that the organisation has service time standards or an awareness of waiting time tolerated by customers. Vallen & Vallen (2009) and Jones & Dent (1994), for example, suggest a four minute target for check-in, while Sill (2004) and Hwang & Lambert (2009) suggests various durations for restaurant throughput times. Obviously customers cannot extend previously agreed limits to time-bound experiences without agreement of the operation. It assumes that they will submit to social conventions, such as vacating the restaurant if requested when the normal meal period has passed, even this can be handled diplomatically by, for example, suggesting that guests may be more comfortable in the lounge.

Capacity includes physical facilities and employees, customers occupy space and time but not all process time involves interaction with employees. At times customers are engaged in purposeful activities, such as asking questions, listening to responses, consuming food etc. All time at the front desk is occupied or waiting for either the operator or customer to complete a task, it is an interaction between employee and customer. At meal times customers 'dwell', they are involved in activities of value to themselves, such as chatting, reading a book, or just staring out of the window but they are not consuming food or engaging with employees.

It will be seen that operators of mass services reduce the amount of interaction time between employees and customers (Schmenner 1986, 2004). Customers, however, need to be allowed to consume the product or service at a pace that they feel is appropriate for them.

2.4: CAPACITY

Capacity is a way of describing either the volume that can be contained by the physical resources at a point in time or the processing rate. As a simple example a 100 seat fast food restaurant has the capacity to process many more customers than a 100 seat gourmet restaurant simply because of the difference in the time it takes for each customer to complete the meal process. The concept of processing capacity thus contains volume and process duration. Capacity utilisation, one of the corners of the process management triangle, describes the proportion of physical capacity that is being used at a point in time, or for a time period.

The maximum capacity of an operation is equal to the maximum throughput rate (Anupindi et al, 2012) and describes the maximum volume of units that can complete an activity or sequence of activities (a process) over a given time period. The effective level of capacity is limited by the volume and capability of resources available and the time required by each unit (flow unit) to pass through the process. Every system has at least one capacity limiting resource (Armistead & Clark, 1994), labour available for example. Two key variables that affect the utilisation of capacity are the arrival rate and processing rate of each flow unit. A river provides a good metaphor here; the water represents demand and the customers flowing through the system; if the amount of water flowing increases then the amount of capacity occupied also increases unless the flow speed increases to accommodate it.

When the arrival rate exceeds the processing rate an ever growing queue forms, but rarely does the arrival rate equal the processing rate. Variations in arrival and processing times mean that at times capacity is either not fully utilised or flow units are waiting in line for their turn to be processed. In river systems lakes and flood plains help accommodate the variation in flow volume over time. Any variation in the volume or performance of resources can impact on the effective capacity of the processing system. Any variation in the arrival rate of flow units or the time that they require to complete an activity can impact on the throughput rate (output of capacity) of the processing system. Queues of arrivals waiting to enter the system and flow units in the system, either being processed or waiting for processing, are inventory. If the volume capacity of the system is not sufficient to absorb the variation in inventory arrival or processing then queues will form. If the process cycle time cannot be shortened to increase the processing capacity then queues will form.

Capacity management is about balancing supply and demand, some attempt at demand forecasting is required if this is to be achieved. Demand forecasting is difficult especially when demand is variable or lumpy (Kalchschmidt et al, 2006). Generally where demand is variable capacity needs to vary, or chase (Slack et al, 2010) demand, if resources are to be used efficiently and customer demand is to be met with acceptable waiting time.

Capacity slack and flexible capacity are required to absorb variability. Capacity slack represents idle capacity that can be utilised at short notice to accommodate a short term increase in demand whereas flexible capacity refers to capacity that has more than one use. Pullman & Rodgers (2009) reviewed approaches to capacity management in the hospitality and tourism sectors and created a list of short-term approaches to capacity management, see table 2.1. Capacity is categorised as physical and human, the human capacity being sub-divided into labour and customers, the management approaches are described as being sources of flexibility.

- Physical Capacity
    - Physical Flexibility
        - Rent capacity
        - Share capacity
        - Hire sub-contractors
        - Change resource allocations
        - Change hours of operation
        - Provide off-site access
        - Use automation
    - Price / Segment Flexibility
        - Partition visitors (status & length of transaction)
        - Yield management
        - Revenue management
- Human Capacity
    - Labour Flexibility
        - Schedule employees
        - Allow overtime
        - Allow idle time
        - Cross-train employees
        - Change work speed and process
        - Hire permanent employees
        - Lay-off employees
        - Use temporary employees
        - Use part-time employees
    - Visitor Flexibility
        - Allow waiting
        - Allow balking
        - Turn away visitors
        - Provide rewards or incentives
        - Provide diversions or complementary services
        - Camouflage the queue
        - Pay for VIP queues
        - Change level of visitor participation
        - Schedule visitors / take reservations
        - Inform / educate about alternative options

Table 2.1: Short-term capacity management approaches (Pullman & Rodgers, 2009).

Armistead and Clarke (1994; 6) define the role of capacity management as “the ability to balance the demand from customers and the capability of the service delivery system to satisfy demand". Capacity management therefore involves the management of processes and customer demand so that there is a balance between the ability of the organisation to supply products and services and the demand for those products and services. The resources of the organisation, such as facilities, labour and equipment, provide the processing capacity. When supply exceeds demand some resources are idle or under-utilised and the organisation perceives that it is losing money. When demand exceeds supply customers may be kept waiting or turned away leading to a possible loss of profit and goodwill.

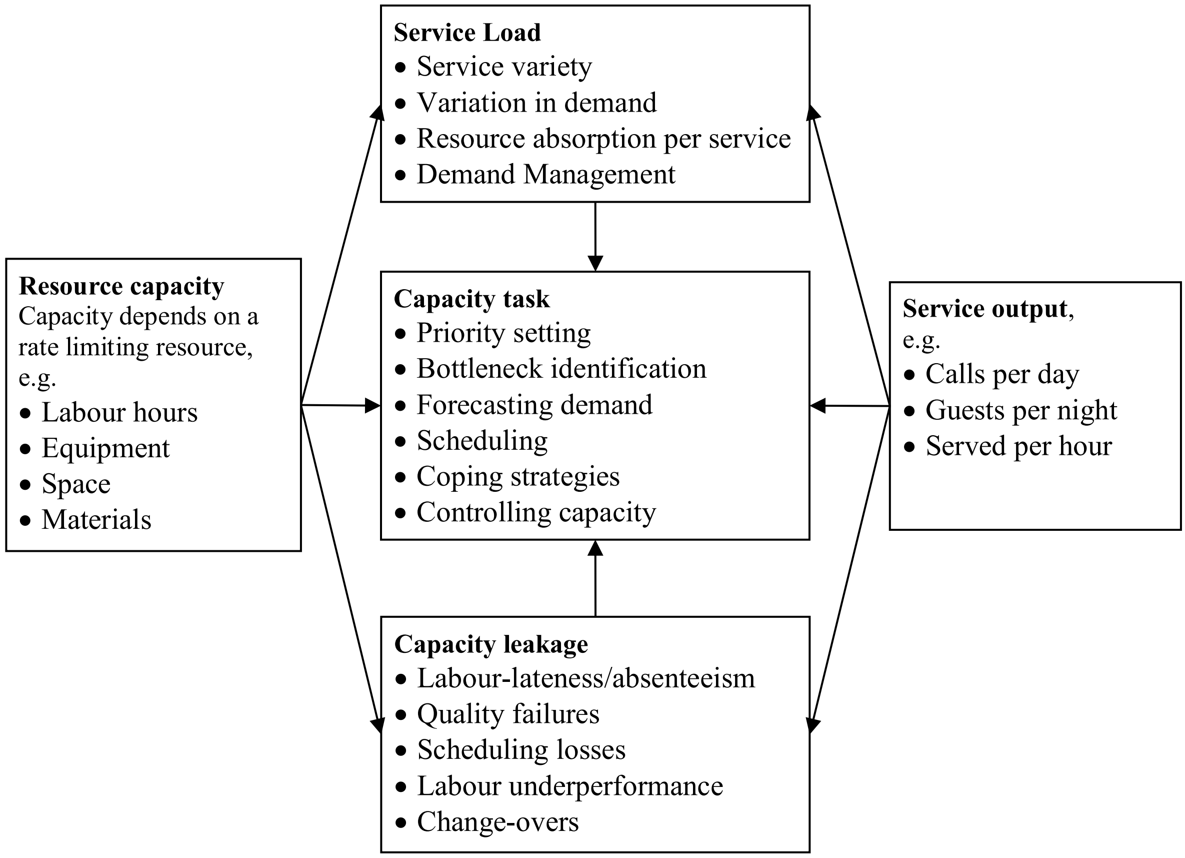

Figure 2.2: Capacity Management. Adapted from Armistead & Clarke (1994).

Table 2.2 interprets the key terms used in figure 2.2.

Capacity task	**Interpretation**
Priority setting	Where there are conflicting demands from customers decisions need to be made about which customer is served first, for example, does the employee answer the telephone or serve the customer in front of them?
Bottleneck identification	Identify and treat the rate limiting resource.
Forecasting demand	Forecasting customer demand so that the necessary resources to meet demand can be acquired and deployed.
Scheduling	Smoothing demand by scheduling it, taking restaurant reservations for example.
Coping strategies	Strategies to implement in services as available capacity becomes insufficient to meet demand in the time frame expected by customers, or when demand is insufficient to keep capacity utilised.
Controlling capacity	Changing capacity in response to predicted and actual demand, i.e. having spare or flexible capacity.

Table 2.2: Interpreting Armistead & Clarke's capacity tasks.

A key concept of capacity management is that effective capacity is set by the rate limiting resource (Armistead & Clark, 1994), the bottleneck. Resources are finite, for example the number of tables in a restaurant, or the number of staff available. There will always be a resource that limits the number of units that can be processed. If an improvement to capacity is to be made then the bottleneck needs to be identified and treated (Anupindi et al, 2012). Once one bottleneck has been treated another will become apparent. Available capacity is also affected by service load and capacity leakage (see figure 2.2), these are sources of variation and will be discussed in that section.

Four actions to increase capacity of a bottleneck are suggested by Anupindi et al (2012). Firstly, the work content of each activity can be reduced. This reduces the load that each flow unit places on the bottleneck resource by reducing the amount of time required. Secondly, increase the processing resources, in batch processing this may mean replacing equipment (an oven for example) with equipment that can process more flow units. Thirdly, if the batch size can't be increased then perhaps the number of processing resources can be increased, additional labour for example. Finally, the scheduled availability of the resource could be increased, by increasing the duration of the service period for example.

Capacity is volume over time therefore it also changes with process cycle time. Effective capacity can be increased, with no change to resources making up capacity volume, by reducing the process cycle time. Low cost airlines, such as Ryanair and Southwest Airlines, are constantly trying to reduce turnaround time because it reduces the number of flights that can be made (Slack et al, 2010); it is a change-over or resetting activity and as such it does not add value. Process redesign involves mapping and analysing the process to identify activities that can be eliminated or have their duration shortened (Mansar & Reijers, 2007). It may also be possible to identify sequential processes that can either overlap or be carried out in parallel (Anupindi et al, 2012; Mansar & Reijers, 2007). Lastly, it may be possible to move or complete some tasks either before the flow units enter the process (pre-process) or after they have left the process (post-process) (Anupindi et al, 2012).

If all waiting time is eliminated theoretical flow time remains (Anupindi et al, 2012). The critical path in a process represents the activities that fix the duration of the process - if flow time is to be reduced an activity on the critical path must be eliminated or have its duration reduced. There are three broad approaches to reducing theoretical flow time (Anupinid et al, 2012):

1. Redesign the process to eliminate errors, remove activities that don't add value and find faster ways of working.
2. Move some activities so that they can be completed in parallel instead of serially.
3. Modify the product or product mix so that it requires less production time.

Ponsignon et al (2012) assembled a list of best practice design principles for processes (table 2.3 and figure 2.7) and argued that some principles are generic while others are dependent on the context. As the goals of different processes may be different the most appropriate design solution is one that best achieves the goals. The paucity of law like principles in operations is not surprising, they are open social systems where a multitude of contextual variables make exact prediction and control difficult (Sayer, 1992). Some principles can be applied to all processes (Posignon et al, 2012) such as the identification and removal of activities that don't add value. These stem from the necessity rather than contextual conditions (Sayer, 1992), in that, by necessity activity consumes time and the removal of an activity on the critical path must necessarily reduce process duration. On the other hand the impact of the replacement of staff by equipment, for example self-check-in, is more conditional on the customer having the capability to use it and the unknown judgement of the experience by that customer. At best, most of the time, conclusions can be drawn about tendencies rather than certainties.

Design practice	Definition and illustration
Eliminate tasks	Eliminate non-value adding tasks from a business process (e.g. checks and verification tasks)
Automate task	Replace employees with automated systems to execute process tasks. For instance, implement automatic cashier systems in supermarkets
Empower employees	Give employees more decision-making authority. For instance, allow sales staff to change the offering to accommodate the needs of high-profile customers
Assign order to whole case worker	Let one employee perform as many steps as possible for single customer requests
Re-sequence tasks (i.e. optimise process sequence)	Change the sequence of tasks. For instance, a retail bank has moved credit scoring to the front end of the loan application process
Make resources more specialised or more generalist	Turn generalist employees into specialists or transform specialised employees into generalists. For instance, at a retail bank, specialist jobs such as credit scorer and pricer were combined into a single position 'deal structurer'
Reduce customer contact	Minimise the number of contact points between the customer and the service provider. For instance, an accounts payable process reduced from three customer touchpoints to two

Table 2.3: Selected business process design principles derived from best practices (Ponsignon et al, 2012).

Lean production, developed in the Toyota factories, is lean because it uses less of everything (Womack et al, 2007), it aims for, though never achieves, continuously declining costs, zero defects, zero inventories and endless variety. A key developer of lean thinking, Ohno, presents the formula "Present capacity = work + waste" (1988; 19). By removing waste the production capacity is increased without the necessity of additional transforming resources. Ohno divides waste into two types, "not needed at all in doing the work", and "No added value but must be done under the present work conditions", the types of waste are listed in table 2.4. Slack (2010) (table 2.5) presents a list of seven types of waste.

Not needed at all in doing the work	No added value but must be done under present work conditions
Time on hand Meaningless transport Stockpiling of intermediate products Changing hands Transporting to a place other than the destination	Walking over to another location to receive parts Removing wrappers from parts purchased from subcontractors Removing parts in small quantity from a large pallet Handling a push button already in position

Table 2.4: Examples of sources of waste (Ohno, 1988; 58).

The seven types of waste
Over-production. Producing more than is immediately needed by the next process in the operation. *Waiting time*. Equipment and labour waiting. Work-in-process waiting for the next stage *Transport*. Moving items around the operation, including moving work-in-process. *Process*. Perhaps the process can be eliminated. *Inventory*. All inventory can be viewed as waste. *Motion*. An operator may look busy but may not be adding value, perhaps the process can be simplified. *Defectives*. Items that need to be reworked or scrapped because they don't meet quality standards.

Table 2.5: The seven sources of waste identified by Toyota (Slack, 2010; 435).

Most of the waste types directly affect throughput time, for example, motion, transport, waiting, rework, idleness, set-ups, unwrapping and quality defects. Inventory can affect throughput time when first-in-first-out is in operation. Customers waiting for service, orders on the board in the kitchen waiting for preparation and rooms waiting to be serviced can be viewed as inventory. On occasions however jobs can be batched or prioritised, for example, it may be possible to prepare several orders for a dish at the same time, and rooms do not have to be serviced in a set sequence.

Some organisations may have customers whose choice is driven by product availability, and the organisation may have high product variety and volatile demand. The key here is to be flexible, responsive to changes in demand. Aitkins et al (2002) refer to this as being Agile rather than being Lean, spare manufacturing inventory is required to cope with immediate and volatile demand (Naylor et al, 1999; Aitkins et al, 2002). Customers are the inventory in this study. Their arrival time is unpredictable and thus volatile, and they cannot be stored for any length of time. The only other factor that can be used to cope with variability in the Process Management Triangle is capacity.

In summary, systems have a capacity to contain a volume of flow units and a capacity to process a certain number of flow units in a given time period. Capital capacity in the form of facilities and equipment is largely fixed but spare and flexible physical capacity can be designed into the operation. Labour capacity can be provided by employees and customers and can be flexed over the short term in response to actual or predicted demand. Systems can suffer a loss or leakage of capacity, effective capacity is what is actually available to the system at a given time. Process duration and pace affect processing capacity. Identifying activities that can be eliminated or shortened can enable an increase in processing capacity. Flow units that have the capability to complete some of the process activities reduce the load on system resources and enable them to cope with greater variations in demand.

2.5: CONCEPTUALISATION OF PROCESSES AND RESOURCES

Objects are defined by us by their physical separation, but they can also be seen as bundles of processes. The use of an object is in what it does, in its properties; its properties are exhibited within processes (events), they are exercised, or not, by the stimulation (or lack of) the powers of other objects. All objects have arrived at their present state as a result of processes and continue to be subject to processes.

> "A process consists in an integrated series of connected developments unfolding in conjoint coordination in line with a definite program. Processes are correlated with occurrences or events: Processes always involve various events, and events exist only in and through processes.
>
> Processes develop over time. Even as there can be no instantaneous wail or drought, so there can be no such thing as an instantaneous process. Processes will always involve a variety of subordinate processes and events." (Rescher, 1996:38)

Time moves in one direction (the eggs in an omelette can't be uncooked and reconstructed). Process time represents how long it takes for any particular interaction of powers to complete the event or outcome defined by the process or describes how much chronological time has passed before the present state of the process has been arrived at. Duration can be said to be generated by the need of process to take time. Time is a property of process.

Rescher (1996) moves beyond the process view of operations to view everything as clusters of actual and potential processes, "things simply are what they can do – or rather, what they dispositionally can do and normally would do" (p47). Properties of objects represent responses that are elicited by their interaction with other objects (clusters of processes).

The powers of entities such as resources are emergent (Sayer, 1992). It could be enough, for example, to say that customer arrivals are stochastic, rather than get involved in a recursive investigation of what led customers to arrive at different times, or their mental processes that drive their decisions, or the biology of the brain that enables decision making to take place.

There are principles that hold, by necessity, across all processes because of the space that objects occupy and the time that process requires. There is no such thing as an instantaneous process, "a process is a coordinated group of changes in the complexion of reality, an organized family of occurrences that are systematically linked to one another either casually or functionally" (Rescher, 1996:38). Changes occur within processes and are as a result of the powers and liabilities of objects, changes are sequential in the sense that one state is required to exist before another can occur. Process is a way of conceptualising, cause and effect, change and events, by necessity it consumes time.

The Oxford Reference Online defines process as follows:

> "a series of actions or steps taken in order to achieve a particular end: *military operations could jeopardize the peace process*. a natural series of changes: *the*

ageing process. a systematic series of mechanized or chemical operations that are performed in order to produce something: *the manufacturing process is relatively simple*. 'a series of interdependent operations carried out by computer.' [as modifier] *(Printing)* relating to or denoting printing using ink in three colours (cyan, magenta, and yellow) and black to produce a complete range of colour: *process inks*."
("process, noun" Oxford Dictionary of English)

There are types of process, some of which involve human action, interaction and decision making, such as the military operations example in the definition above, or business processes as defined below. The other definitions of process are orientated around natural physical principles; they are rooted in the mechanical, biological and chemical sciences. Physical processes often feature as part of an activity or stage in a business process. In the above definition the manufacturing process is cited as an example of mechanized or chemical operations. However production can be viewed as part of a larger business process, for example, order fulfilment. The fulfilment of a food order will require a series of actions following a procedure that has been developed over time and perhaps written down. Supervision or performance measurements may be in place to ensure that the procedure is followed and thus the desired outcome attained. In response to the order an item, perhaps a dish of food, needs to be manufactured and information about the order needs to be recorded, perhaps by being processed on a computer. Thus a process can involve the transformation of people (customers), information and materials.

An activity can also be conceptualised as an event and as such has causes and effects (Sayer, 1992), an event brings about, or causes, a change in another object. Activities require objects to perform them. Some of these objects are transformed or consumed by the activities, becoming an output; others remain and can be reused. The activities that are identified with the production of an output can be conceptualised as a process, a process is therefore a series of events with causes and effects. The cause may be physical in the sense of mechanical, biological or chemical. It may also be the result of a human decision. This decision may be driven by the innate tendency to follow social norms, or may be the result of the expression of some other motivation. If reasons can be causes (Sayer, 1992), then mental states that are used to justify reasons are also causes, for example, desires, needs and beliefs. Reasons can be internal states that motivate action.

Lindsay et al (2003) and Vergidis (2008) explored literature for definitions of business processes and conclude that there is no agreement on the precise definition of the concept. Processes are not necessarily linear and do not always end in a material output. Generally definitions indicate that processes are activities structured to achieve a goal. Vergidis (2008) concludes that most definitions cite either Hammer and Champy or Davenport. Hammer and Champy define processes as "a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer." (Hammer & Champy, 1995; 35). Davenport defines processes as "A set of logically related tasks performed to achieve a defined business outcome." (Davenport, 1990: 12). Later Davenport (2005) defines processes as "simply how an organisation does its work – the set of activities it pursues to achieve a particular objective for a particular customer, either internal or external" (p102). Palmberg (2009) conducted a structured literature review to identify definitions and models of process management; the search was eventually narrowed down to 77 articles. The various definitions of process are distilled to “A horizontal sequence of activities that transforms an input (need) to an output (result) to meet the needs of customers” (ibid: 208).

It is assumed that organisations are goal orientated in their activities (Davenport 1990), perhaps it makes more sense to start with the goals and ask how work needs to be arranged in order to arrive at the goals. Organisations exist for at least one purpose; a purpose can be viewed as an intended output or outcome. The word output is more suited to describe something tangible or easily measurable whereas the word outcome infers a change in state that may not be tangible, such as satisfaction or a financial target. Outputs and outcomes do not appear spontaneously, they are preceded by activities (procedures, tasks, routines) designed to produce them, for the sake of brevity the word output will be used to refer to both output and outcome.

If everything that exists is undergoing change, being transformed, in something described as a process (Rescher, 1996), then it is a word that encompasses much. The concept needs refining by the use of different or additional words, adding the word ‘business’ places the term in the context of production and exchange but still leaves the researcher with something vague that is supposed to give meaning to a very large variety of activities. The short definitions of what a business process is do little more than boil down the great variety of process manifestations to a few key characteristics. It is rather like settling on a definition of technology only to reflect that the great variety of the nature of technology renders the definition of little practical use. The components of a process and their properties, if planned, will at least be required to have the capability to produce the required outcome. At least one role of theory is conceptualisation (Sayer, 1992), the vague concept of ‘business process’ and its relationship to throughput time needs to be explored.

2.5.1: Process as causal mechanism

Managers are supposed to be able to exercise some control over the resources and processes of the organisation (Slack et al, 2010). The act of controlling must involve knowledge about cause and effect. The manager looks into the future and predicts the likely behaviours of the components of the process so that the desired outcome of the decision is achieved.

The effects that objects *can* exhibit are defined by the nature of that object - objects can be tangible or intangible. The nature of an object includes the attributes that describe it and the actions that it is able to perform. The effects that they *do* exhibit depend upon the nature of the objects that interact with them (Sayer, 1992). Water, for example, can be used to cook an egg but only when heat is applied to bring it to the boil for several minutes. The process may have been initiated, or caused, in response to a human need but the execution utilises physical properties of the objects to transform the state of the egg to the planned state. A discussion of the nature of causation is contained in the methodology. Tangible objects that, by their nature, are able to contribute to the construction of the planned output are pre-selected for the process. A hotel reception area, for example, is conventionally used to check guests into and out of the hotel. To the arriving guest it must be recognisable as such and contain the equipment and materials necessary for the activities for which it is designed. Humans have made use of the powers of natural objects and processes to create objects that they can utilise for their satisfaction.

Humans can be regarded as physical objects that are general in design; that can be adapted for more than one purpose. There is an important difference between physical objects and humans; humans are conscious objects that have the ability to reflect on and make choices about their behaviour (George & Bennett, 2005; Sayer, 1992). Organisations exist because of this ability; they define rules and procedures and provide examples of desirable behaviours in an attempt to channel behaviour so that it contributes to the achievement of the purpose of the organisation (Sayer, 1992). Business processes need to be designed, directed and controlled (Slack et al, 2009). Policies and procedures are developed to guide behaviour, but people react with their subjective interpretation of 'the world out there' which may not be the same as how the world 'really' is, or how another interprets it (Gilbert, 2007). Because of the flexible design, heterogeneous knowledge, values and abilities and the reflective nature of humans, exposure to the same stimuli may be followed by different analyses and different conclusions. Thus the outcome of processes that involve human objects can be more variable and be assessed subjectively by varying criteria.

To examine process speed it is insufficient just to look at the nature of the physical resources and processes. Hotel processes frequently involve a sustained interaction between customers and employees. Social interaction requires interpretation and negotiation of meaning and reasons can be causes of events (Sayer, 1992). Employees are required to learn scripts and procedures to follow, they are also expected to be flexible and adapt 'on the fly' to any particular social situation. The customer is sometimes required to adapt their behaviour to the particular procedures of the hotel. The control over the exact form of the product or service is ultimately in the hands of the front-line employee and not in the control of the supervisor or manager. The interaction between people is thus very different to the interaction between materials and machines.

Fleetwood (2004) talks about causal configurations and describes them as "a cluster of causal factors or components, which in this context (labour process theory) are, typically, social structures, positioned practices, relations, rules, resources, and so on.", further, "Causal configurations are emergent phenomena. That is, when certain components are assembled, they give rise to properties that are not found in any of the components." (p48). Causal configurations have a tendency or typical way of acting. A process can perhaps be regarded as a causal configuration, an assembly of objects with their own powers that interact to create a tendency for certain effects or events to occur. A goal of management is to manage the configuration, and any interacting configurations, so that the effect or event (output and outcome) of the tendency is as the organisation expects. Tendency implies probability rather than certainty of outcome; managers seek to improve control to reduce the variability implied in a tendency.

A process is thus a causal mechanism:

> "… we define causal mechanisms as ultimately unobservable physical, social, or psychological processes through which agents with causal capacities operate, but only in specific contexts or conditions, to transfer energy, information, or matter to other

entities. In doing so the causal agent changes the affected entity's characteristics, capacities, or propensities in ways that persist until subsequent causal mechanisms act upon it."

(George & Bennett, 2005: 137)

If mechanisms are the events that link effects to cause (McAdam et al, 2008) and mechanisms are a type of process then a process view of operations and an understanding of the concept of causal mechanisms could be applied to explain the causes of throughput time.

If, as Punch (2005; 8) suggests, "the aim of social science is to build explanatory theory about people and their behaviour", then this research aims to explain how an organisation such as a hotel can deliver products and services at a speed that satisfies customers. It is adopting an operations and process view and as such is investigating how resources and processes can be configured so that a causal link is created between that arrangement and the outcome of satisfactory time duration from the customer's viewpoint. The concept of causal mechanisms appears to fit with the operations and process management view of the world.

2.5.2: Transformation model of process

The conventional way of presenting the role of processes in operations is by means of the transformation diagram (Anupindi, 2012; Johnston et al, 2012; Slack et al, 2010). The input objects are referred to as resources in operations management, objects of value to the organisation. The activities of the process consume time and are referred to as a transformation processes, transforming or converting the nature of resources. Figure 2.3 shows the basic transformation model in which inputs are transformed, or converted, by a process to produce an output or outcome in the form of goods or services.

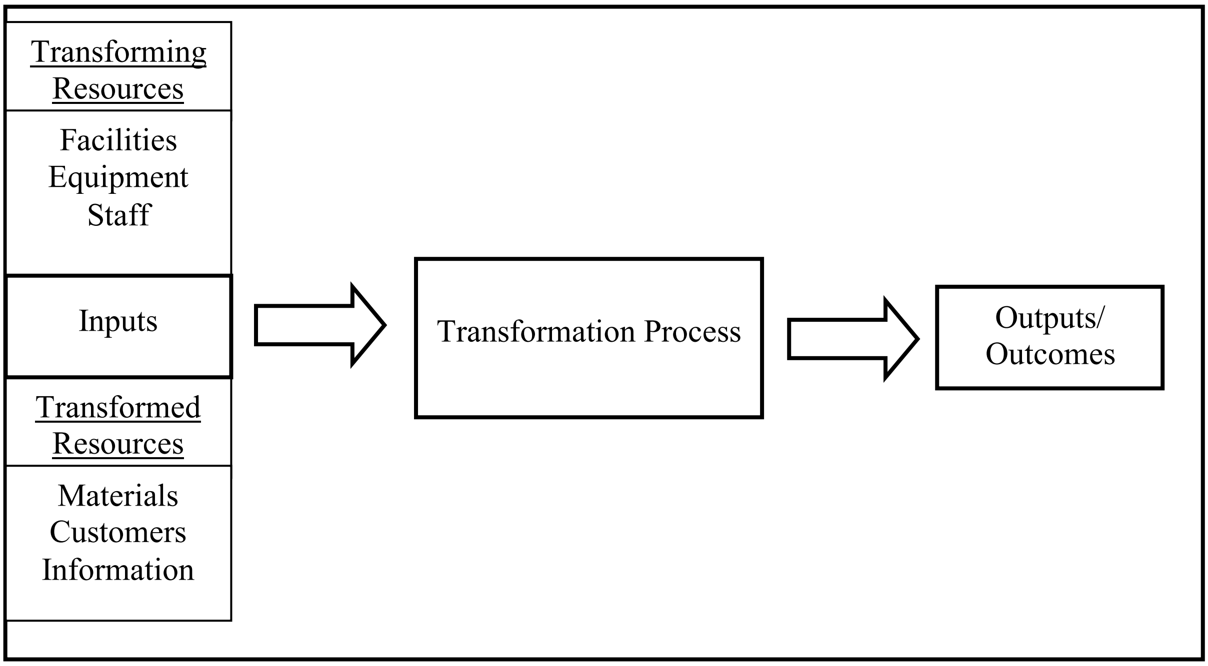

Figure 2.3: The transformation model. Based on Armistead et al (1995).

The transformation model includes resources transformed but not always consumed, such as information, with each cycle of the process a copy of the information may be retained and added to a record. It is clear, however, that even the transforming resources that appear intact after they have carried out the transforming may have undergone some change themselves. Transforming materials experience wear and tear and eventually need to be replaced. Humans may gain knowledge from their experience enabling them to improve their performance when they repeat the process.

Anupindi et al (2012: 3) adopt the same input-process-output sequence but list five elements that characterise the transformation (see figure 2.4):

1. Inputs and outputs
2. Flow units
3. Network of activities and buffers
4. Resources
5. Information structure

The transformed resources are conceptualised as the inputs that flow into the process and are the objects that the process is transforming. The transformed flow unit is the output. The transformation process is referred to as a network of activities and buffers (work-in-process inventories or queues). Resources (capital and labour) and the information structure equate with the transforming resources. Conceptualising inputs as flow units triggers an analogy to the behaviour of liquids.

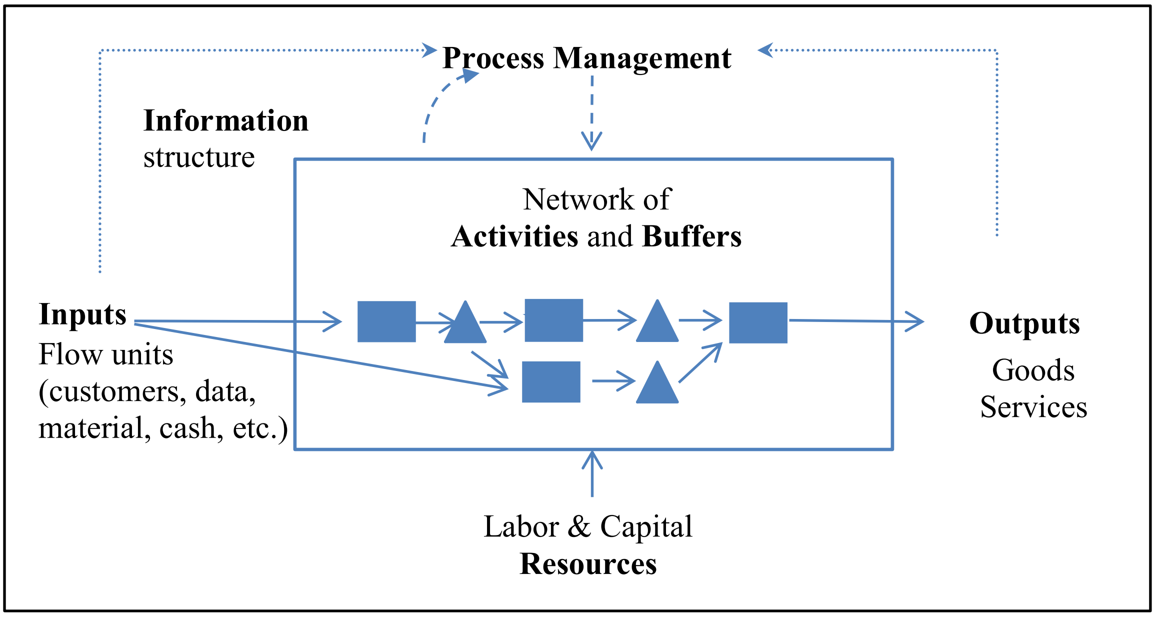

Figure 2.4: A process as a network of activities and buffers (Anupindi et al, 2012).

Three categories of object are transformed; customer, material, and information (Armistead et al, 1995; Morris and Johnston, 1987; Slack et al, 2009). Armistead provides examples of the transformations that each category might undergo while Morris and Johnston (1987) argue that what the process transforms can be an important source of variability that impacts upon process duration. Anupindi et al (2012) categorise the transformed resources as flow units, the items in the process and list them as orders, products, supplies, customers, projects and cash. This categorisation can be regrouped to conform to the three categories, (see table 2.6).

Type of process	Flow unit	Conversion & examples
Customer	Customers	Physical: Hairdressing Location: Airline or rail travel Physiological: Health care Psychological: Entertainment
Material	Products Supplies	Physical: Steel strip into car bodies Location: Postal delivery Storage: Warehousing
Information	Orders Projects Cash	Reconfiguration: Financial services Location: Telecommunication Storage: Records

Table 2.6: Examples of process type conversions (Armistead et al, 1995; Anupindi et al, 2012).

The figures showing processes summarise the categories of objects that comprise the process. The objects shown, however, are really groups of objects of a certain type. Anupindi et al (2012), for example, summarise resources as labour and capital but break capital down into land, buildings, facilities, equipment, machines and information systems. Labour is categorised by the roles of employees. Slack et al (2009) describe operational processes as flows between resources consisting of people and facilities and reproduce the Armistead model (figure 2.3)

Object Collection	**Object**	**Object**
Input Flow Units	Customers Materials Information	
Activities (By time relationship to the flow unit)	Pre-service encounter Service encounter Post-service encounter	
Buffer	Store Queue	
Resources		
	Capital	Facilities Layout Equipment Stock
	Labour	Employees Customers
	Knowledge	Tacit Explicit (concrete)
	Information	
Organisation	Positions Rules (policies) Powers (control) Culture	

Table 2.7: Examples of objects.

Objects have properties. Table 2.7 lists examples of objects showing that something does not have to be tangible to have properties and effects. The definition, from computer programming, following splits these into attributes, such as size and colour, and methods as actions that it can perform:

> "A property is an attribute of an object or an aspect of its behaviour. …To change the characteristics of an object, you change the values of its properties.

A method is an action that an object can perform. For example, just as a document can be printed, the **Document** object has a **PrintOut** method. Methods often have arguments that qualify how the action is performed

In most cases, methods are actions and properties are qualities. Using a method causes something to happen to an object, while using a property returns information about the object or it causes a quality about the object to change."
http://msdn.microsoft.com/en-us/library/office/aa211958(v=office.11).aspx

The objects that take part in the process have properties. Some of these properties describe the physical attributes of the object, such as size, age, origin or tangibility. Other properties have the power to cause events, to bring about transformations in the process flow units. It is through the identification of correlated events that a process is identified and "events exist only in and through processes" (Rescher, 1996:38). A process is a series of events with causal links. For practical purposes, events are caused by interaction with the properties of another object. The power of a human to select and push a button on the computer keyboard, for example, initiates (causes) a series of events within the machine. The events that that the machine can cause depend upon the properties of the machine parts, for example, it may cause a customer to be registered as the occupant of a specific bedroom. Human objects are physical objects but they also think and feel. They tend to exercise certain properties but they are heterogeneous and different individuals may exercise different properties in the same circumstance.

In this view business processes are a series of events designed to produce a certain outcome. The objects, or resources, used can be substituted for others as long as the substitute can act in a way that produces the desired event or outcome.

Non-human objects are usually designed or pre-selected to be as uniform as possible. Employees are preselected for their actual or potential abilities to exercise (or restrain) certain powers in a controlled fashion. One of the properties of being human is the power to enter into a contract with an organisation and agree to exercise some powers and not others. Organisations have only limited control over the properties of customers and the properties that they choose to exercise. Customers are therefore usually the greatest source of variability in any process.

A key feature of processes that involve the customer is the variability that the customer brings into the process (Chase, 1978, 1981; Morris & Johnston, 1987; Schmenner, 2004). The key difference between managing services and manufacturing is the behaviour of the customer in the system. Materials tend to have less variability than customers and thus production time can usually be more easily controlled, conformance of a tangible product to a specification can be checked before the customer becomes involved. The main material transformation processes that directly affect customers in hotels are food and beverage production and room servicing. Information can be held in a digital format on computers, by their nature computers can process quickly and accurately (O'Connor, 2000). Often processes involve a combination of process types, for example, the check-in process usually involves the customer and information.

2.5.3: Process hierarchy

A process can be 'exploded' into more detailed descriptions of the components that comprise it. Palmberg (2008) lists these in increasing level of detail as process, sub-process, activity and task. A step or series of steps, such as seating a customer in the restaurant, might be described as a task; this could be viewed as part of the general activity of restaurant service, which itself could be viewed as a process consisting of sub-processes. The application of these labels is subjective and the differentiation is only important when the terms are used in conjunction with each other. Other words are also used to describe processes or parts of processes, such as procedure and routine. Organisations often prepare Standard Operating Procedures that describe the way in which a process is to be performed.

Armistead et al (1995) describe a similar four tier structure, or 'process breakdown structure' (p50); in levels of increasing detail these levels are process, process elements, element activities and activity tasks. They attempt to be prescriptive about the application of the terms; process refers to the main business processes (strategic, customer service, operations flow and administration flow), process elements refer to the main activities of the organisation, such as health and safety or managing materials. Activity tasks are assembled into Standard Operating Procedures.

2.5.4: Process stages and customer contact

High customer contact services are inefficient because of the behaviour of customers (Chase, 1981, Schmenner, 2004). A process can be broken down into sub-processes or activities and categorised as pre-process, in-process and post-process (Maister, 1985; Dubé et al, 1991; Noone et al, 2008). Pre-process activities are generally categorised as the period after customers have arrived but while they are waiting for service to start (Maister, 1985; Dubé et al, 1991; Kimes, 2004; Noone, 2008). Anupindi et al (2012) suggest moving activities off the critical path. Some activities required to complete the process may either not involve the flow unit (e.g. the customer) or may not require the physical presence of the flow unit in the system. Sometimes activities can be completed before the flow unit arrives to be processed or after it has been processed. By identifying activities that can be completed without the presence of the customer the time spent 'in-process' by the customer can be reduced. If the arrival time of customers is variable then resources can be gainfully employed in pre-process and post-process tasks while waiting for customers to process.

The in-process stage is characterised by the interaction between the flow unit and at least one of the resources required for the process. If the resource and flow unit are human, service literature frequently refers to this as a moment of truth or service encounter. The in-process stage does not always need to be tightly bounded by time. Customers may be able to fill out forms remotely at a time and of a duration that suits their needs.

2.5.5: Process as a capability (RBV)

The Resource Based View (RBV) argues that the selection and arrangement of resources can result in capabilities that provide an advantage in the market. Resources consist of "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Daft, 1983 cited in Barney, 1991:101). In other words a resource is any entity that the organisation can use that has properties that help achieve its performance objectives.

While a process can be viewed as a resource it is also the object that provides the recipe for resource application, the routines that utilise resources to achieve desired outcomes (Peng et al, 2008). The term 'routine' may be used to describe a process or a number of interrelated processes. As capabilities arise from the nature of resources and processes the RBV is compatible with a process view of organisations. The performance outcomes of a process represent the expression of capabilities. Peng et al define a capability as "the strength or proficiency of a bundle of interrelated routines for performing specific tasks" (2008; 734).

Klassen and Menor (2007:1030) propose that "strategic alignment between market and process establishes the basis for the relative levels of capacity utilization, variability and inventory. However, developing capabilities that reduce variability or increase flexibility are necessary to make a corresponding reduction in inventory and improve responsiveness and cost". If a role of management and operations strategy is to align operations with market need

(Slack and Lewis, 2011) then it is important to configure resources and processes in a way that satisfies the needs of customers, in this case, for appropriate throughput time.

2.5.6: Perspective on the process

The world is interpreted and conceptualised and the perspective that is held of a concept may vary depending upon one's point of view. The understanding of the nature of a process can be influenced by the ontology of the researcher. Melão and Pidd (2000) provide four classifications of business process ranging from a deterministic, positivist view as mechanical closed systems through to an interpretivist view of processes as social constructs. Business processes have a "mixed and conflicting nature. They have technical and social, tangible and intangible, objective and subjective, qualitative and quantitative dimensions" (Melão and Pidd, 2000: 123). Different processes are likely to fit more comfortably into different classifications, Melão and Pidd, for example suggest that bureaucratic paper based and fast food processes are largely deterministic and infer that many front and back office processes are more like complex dynamic systems.

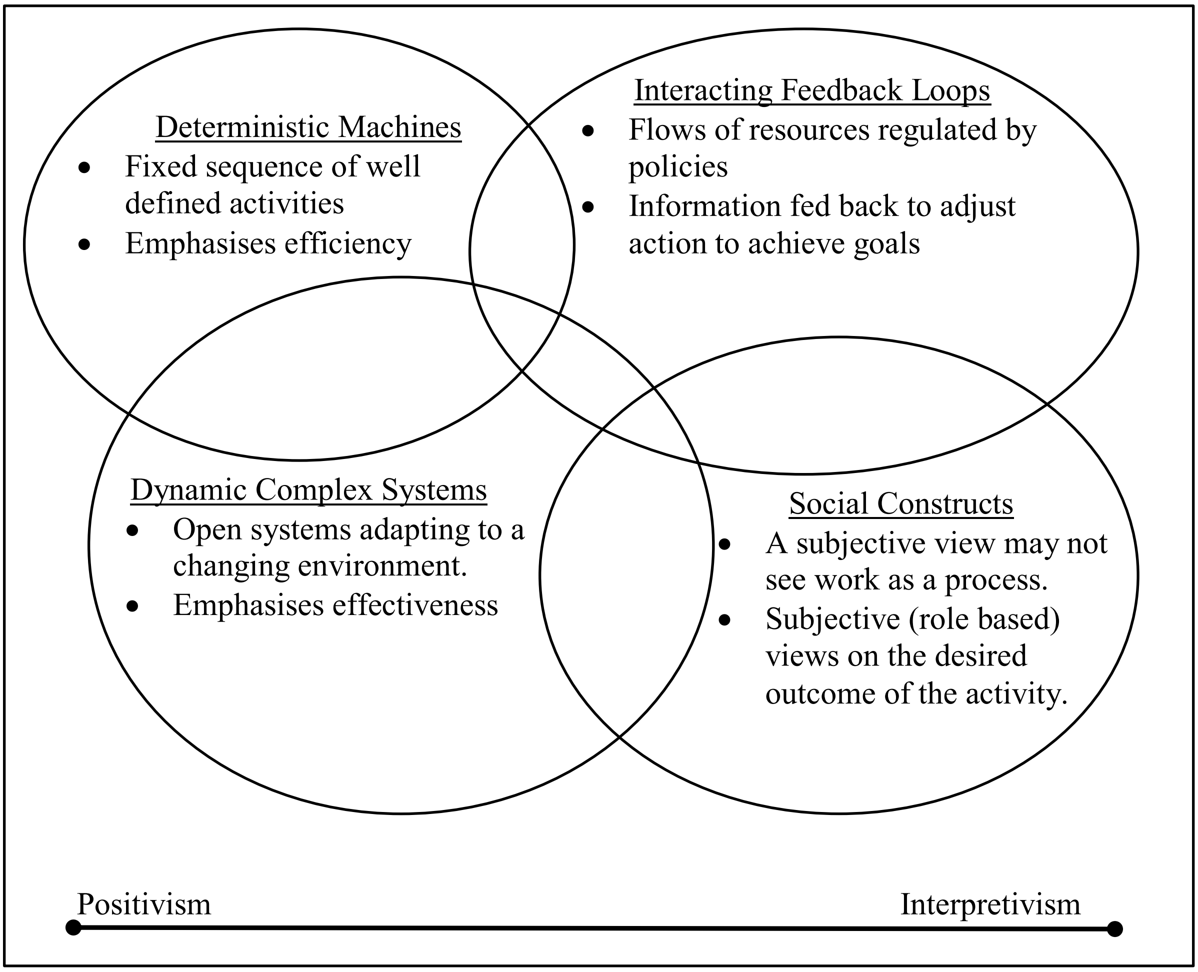

Figure 2.5: Business process views vs. paradigms (Melão & Pidd, 2000).

The greater the contribution of the customer to the creation of the output of the process the less it can be deterministic, in other words, the more their needs and motivations shape the progress of activities. The perspective on the process will vary with the reasons for the actor's involvement, reasons may be goals. The organisation may be pursuing goals of efficiency by attempting to control the resources consumed by the process. The employee may be motivated by the personal benefit gained, such as money, personal development or just getting through the day so that they can go home. The customer may be motivated by the desire to satisfy an emotion, or simply, for example, to get on an airplane as soon as possible so that they can secure overhead locker space near their seat!

The characteristics of the service being offered will shape the properties of the processes. Schmenner (2004) argues that organisations have a tendency to seek increases in productivity and that productivity increases with the speed by which units flow through the process. An unchanging level of capital and labour resources can increase the number of flow units it processes and be more productive by process time reduction. Throughput time variability needs to be eliminated, it represents a waste that disrupts swift even flow causing delays and reducing productivity. Schmenner (2004) argues that productivity falls with increased variability in process flow "Throughput time is indicative of the waste in a process. The longer the throughput time, the more likely waste of all types bogs down the swift flow of materials." (p335). The sources of waste are considered in a later section. Processes are classified by their degree of time variability and the amount of customer interaction. The interaction with staff is often referred to as the service encounter in services literature. Generally the more opportunity the customer has to interact the more time they consume.

Hospitality operations are characterised by high fixed costs, as much as three quarters of total cost (Kotas, 1999), the variable cost of any service is therefore low. The more customers that a business processes the more flow units there are that can share the large fixed costs. As long as average unit variable costs and price are not increased, by shortening process duration the organisation can increase the number of customers that it processes in a given time period and improve its contribution margin. The contribution margin represents what is left over from the value of a sale once the variable costs have been removed. Essentially this is fixed costs and profit. The more customers there are the more the fixed cost can be spread out among them, the lower it becomes per transaction, as fixed cost per transaction decrease, profit per transaction increases. Using existing fixed capacity to process more flow units generates only variable costs. Thus organisations want to serve more customers with few or no additional resources. Generally operations only have control over variable costs but by processing more customers with the same (or lower) value of resources the operation reduces

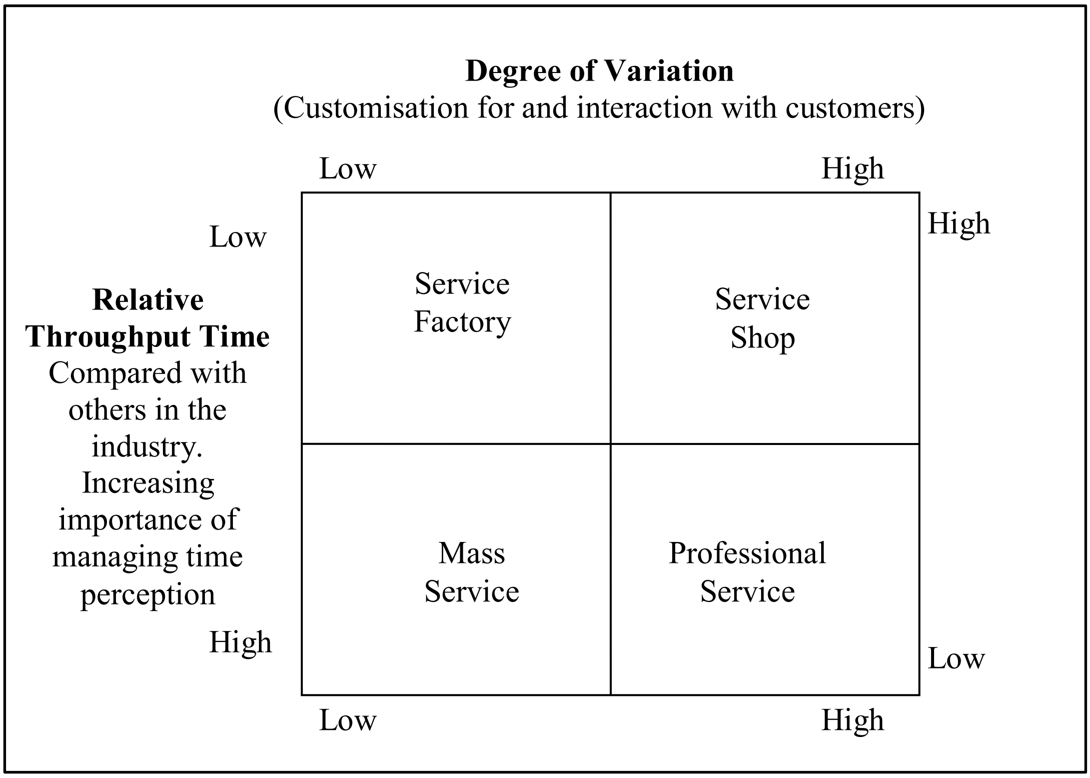

Figure 2.6: Classifying Services. Schmenner (2004).

the proportion of fixed costs per unit and contributes to productivity and profitability.

The service factory (see figure 2.6) is where encounters with customers are short and there is little product customisation, fast food restaurants for example. An alternative is to give customers control of customisation while still keeping service encounters brief, a buffet restaurant for example. The key feature of both is allowing customers to choose how long they take to consume the product while keeping encounters brief so that a greater volume of customers can be served by each server. In some material processing systems, for example, distilleries and dairies, physical capacity must be provided for materials to process themselves. When customers are 'self-processing' sufficient physical capacity in the form of space, furnishings, fittings and equipment needs to be provided to allow the customers to dwell while they consume (process).

Parasuraman (2002) argues that quality suffers when this "producer-orientated" view of productivity dominates. Services are experiences in which the customer co-creates simultaneously with the producer (Vargo and Lusch, 2006). Customers input their own resources such as time, effort and emotional energy. The producer can calculate the cost of the input resources. The cost from the customer's perspective is generally perceived and does not have a constant objective value. Customers put a value on their time but this subjective valuation varies between customers and the context of the wait. Processes in which the customer participates are affected by customer behaviour. The differing needs and skills of customers results in time variability in the duration of the activities of the process disrupting smooth, even flow (Schmenner, 2004).

Interaction with customers and customisation of the service varies in degree between types of operation. Schmenner (1986:23) defines high interaction as "where customers can actively intervene in the service process, at will, often to demand additional service of a particular kind or request that some aspects of service be deleted." He defines high customisation (p24) as a service that "will work to satisfy an individual's particular, and perhaps full range, of personal preferences. A physician typically gives a very individual customized service." He then uses food service operations to give an indication of degrees of customisation (table 2.8). The labels given to the degrees of customisation and the actual categorisation is vague, clearly Schmenner does not intend a rigid classification of levels of customisation or interaction. Generally he seems to indicate that, at least in food service, higher customisation is accompanied by higher interaction.

Degree of customisation	**Food service example**
Low	KFC, McDonalds.
Some	BurgerKing, Wendy's.
Even more	Cafeterias.
Next in line	Restaurants with salad bars that have some waiter assistance.
Finally	Restaurants with extensive waiter service.

Table 2.8: Examples of degrees of customisation (Schmenner, 1986)

By reducing customer process and waiting time or by moving towards the features of a service factory the operation becomes more productive. Organisations are therefore more likely to consider changes that achieve appropriate throughput times if those changes also improve productivity.

The service classification by Schmenner can also be interpreted as operations adopting different strategic positions. Ponsignon et al (2012) suggest that service operations are either generally cost leaders or focused differentiators, key characteristics of processes differ depending on the strategy. The appropriate process design principles for each strategy are different, see figure 2.7. To avoid competing on cost an organisation needs sufficient differentiation to attract a pool of customers, even within an organisation some processes will have a cost focus while others will be there to provide a source of difference. Process is the object that provides the recipe for resource application, the routines that utilise resources to achieve desired outcomes (Peng et al, 2008). The term ‘routine’ may be used to describe a process or a number of interrelated processes. As capabilities arise from the nature of resources and processes the RBV is compatible with a process view of organisations. The performance outcomes of a process represent the expression of capabilities. Peng et al define a capability as “the strength or proficiency of a bundle of interrelated routines for performing specific tasks” (2008; 734). Wu et al (2011) argue that generic principles such as the universals in figure 2.7 cannot be a source of competitive advantage, whereas context dependent operational capabilities are derived from organisational capabilities and can be rare or unique. Generalised theory is extracted from the common points of contexts so may exclude context specific factors. The grouping of businesses by strategy context is not helpful when considering hotels where different design principles are applied to different processes depending on the level of variability in customer inputs.

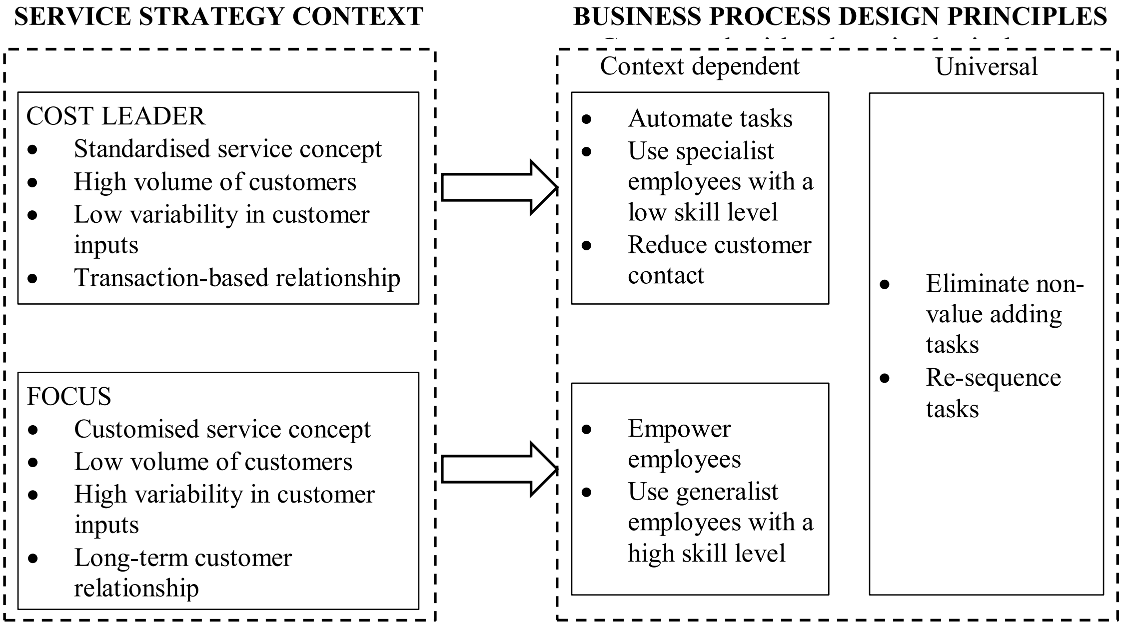

Figure 2.7: A contingency-based model for business process design in service organisations (Ponsignon et al, 2012).

The reasons for involvement in a process and what participants want to get out of it are often heterogeneous, perhaps even conflicting. If organisations are seeking productivity improvements then, in processes that affect the customer, they need to think carefully about what adds value for the customer. There is a need for there to be an alignment between the planned outcomes of the process and the needs of those who pay for it, the customer. The appropriate process design depends on the extent to which it needs to satisfy the goals of each participant to achieve the performance objectives of the organisation.

2.5.7: Process Conceptualisation Summary

Theory is an attempt to organise, categorise or make sense of the way the world works. This understanding enables humans to predict the effects of combinations of resources and actions; it gives them the control that they seek.

Everything changes, everything is in process, properties of objects and the events triggered by their interactions bring about change. Time can be said to be caused by process. At a more practical level it is common to talk about operations and process management and to conceptualise business processes as a particular type of 'man made' process. Man has created the world today by predicting the links between cause and effect and designing routines to follow that combine resources and activities that cause the effect desired.

Essentially a business process is a goal orientated configuration of resources and activities. Beyond that it can be argued that there are many ways of conceptualising and classifying processes. Essentially the goal of the process decides the nature of the resources and activities, or vice versa! The management goal is to shape the processes and resources so that they produce events that satisfy the needs of the market. They also need to balance customer satisfaction with the need to control or reduce resource costs. What a process looks like depends on what it is for and how ingenious the designer has been in finding ways to achieve the sometimes competing goals of customer satisfaction and cost control.

2.6: VARIABILITY:

2.6.1: Introduction

The aim of this section is to discuss variability and its effect on throughput time. Time variability in the production and delivery of goods and services can be caused by a number of factors. Some of these causes can be found in the behaviour exhibited by the nature of the resources and flow units, others in the activities that represent the processes. Where uniformity of resource, activity or flow unit does not exist variability must exist. Generally the less uniformity and predictability there is then the more variability there is. This section will explore the types, sources and treatments for variability but will first discuss why variability can be a problem.

The key difference between services and manufacturing lies in what is being transformed in the process (Morris & Johnston, 1987; Frei, 2006), the flow unit. The amount of variability in customer processing operations is higher than in information and material processing operations (Morris & Johnston, 1987). Restaurants combine customer and material processing (Jones et al, 2003). The front desk combines customer processing with information processing. The more customer contact during a process the less is its potential efficiency because of the variability that the customer introduces (Chase, 1981).

Vargo and Lusch (2006) argue that in services the customer is a co-creator and that service only comes into being at the request of the customer. Customers are inherently variable so the process needs to be capable of coping with the variability (Frei, 2006). Seddon (2005) bemoans how customer service centres are driven by volume and duration targets rather than the variety of time needs of customers. Variation is inherent in business systems (Seddon, 2005; Anupindi, 2012; Slack, 2010).

All systems contain some level of variability in process duration. This is especially true for situations in which the customer is a co-producer. Quantitative queuing theory asserts that as the capacity utilisation of a process increases, waiting time increases exponentially (Anupindi et al, 2012; Slack et al, 2010; Suri, 2010). Suri (2010) suggests that manufacturing systems should consider keeping their resource load to 75%, services experience more sources of variability than manufacturing systems. In systems where variability is greater waiting times start to rise at lower capacity utilisations (see figure 2.8). Armistead & Clark (1994) suggest that in service industries managers do not monitor or recognise the onset of what they call ‘the coping zone’. The key to obtaining a shallow curve and thus short in-process waiting times at higher capacity utilisations is reducing in-process time variability. Because the curve is exponential the application of modest additional resources, spare capacity, or capacity slack can be used to absorb at least some of the variability (Ohno, 1988; Seddon, 2005).

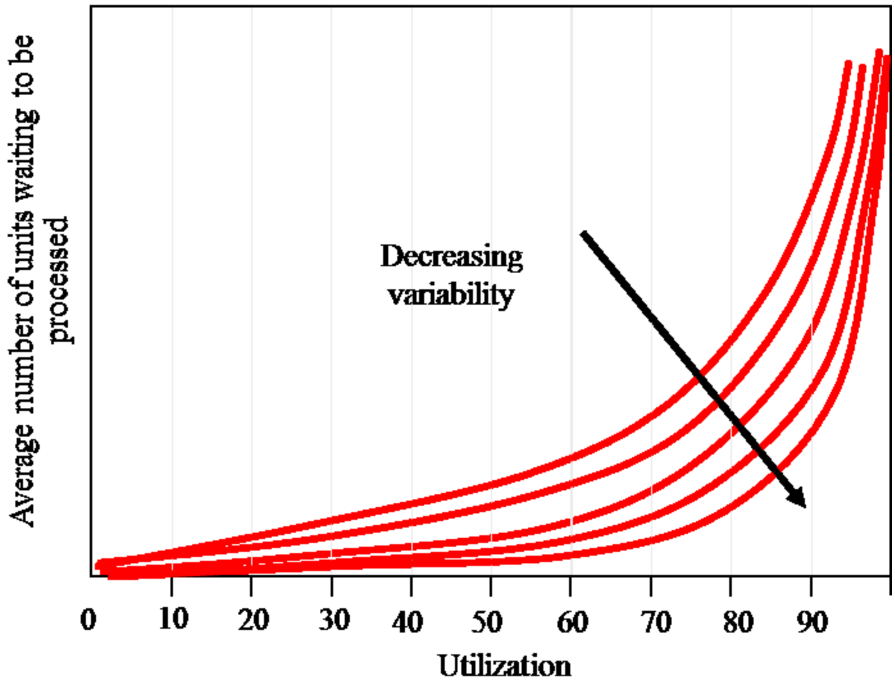

Figure 2.8: Average queue time at different capacity utilisations and levels of variability in arrival and processing times (Slack et al, 2010).

In systems that produce products and services in response to customer demand there is often variability in the timing of that demand, it may be 'lumpy', the lunch time rush for example, or afternoon check-in. In hospitality the customer is often present when the product or service is ordered or may join a queue prior to ordering, patience is limited so queue time must be kept short. During the process different customers may place different demands on the resources available, one customer may have more questions to ask, or may not understand instructions immediately; some customers will request only one course at a meal time, others may request more; customers may eat at different speeds or dwell at the table for different periods of time. The mix of products may also affect duration, for example, it is unlikely that every dish on the menu requires equal preparation time, walk-in customers may require more time at the front desk than those with reservations. Capacity can be viewed as representing the resources available for processing (Anupindi et al, 2012; Slack et al, 2010).

Staff may also have different abilities that introduce time variability into the process. Staff with superior training or more experience may be able to work faster or be able to carry more. An experienced restaurant manager may be able to manage the flow of customers, for example by encouraging guests to order or leave the table, or monitoring tables to ensure service is being received.

2.6.2: Types of variability

Variability that leads to variations in throughput time is partly due to the behaviour of customers and partly due to the system as a process (Bicheno, 2008). Customers are arriving in a stochastic pattern hoping to enter a system to receive a product or service. The nature of the product or service may require the involvement of customers and may allow them choices as to how much service or product they consume, some will consume a lot others a little. The amount consumed and the time constraints of the customer will influence duration. In such a system entry to the system needs to be controlled and an amount of capacity slack is required to absorb the variation. Even though the number of steps or stages of the process may be set, each may be of a variable duration.

Time variability can also be caused by adverse events. These may take the form, for example, of equipment breakdowns, staff absence, inaccurate orders or product quality failures. Some time is consumed by addressing failure demand (Bicheno, 2008; Seddon, 2005), failure demand represents a waste because it is time and additional resources spent correcting mistakes (quality defects) made by the organisation.

Anupindi et al (2012: 241) identify two types of variability affecting production time:

- "Normal variability is statistically predictable and includes both structural variability and stochastic variability.
- "Abnormal variability is unpredictable and disturbs the state of statistical equilibrium of the process by changing parameters of its distribution in an unexpected way. Abnormal variability results from *assignable* or *special* causes that are externally superimposed from time to time."

Normal variability, as defined above by Anupindi, is something that operations managers should drive to bring under control and reduce. It consists of "system causes" which are factors beyond a worker's control, such as seasonality and stochastic sources that arise from chance. Abnormal variability can be due to an unpredictable but usually treatable cause such as employee absenteeism, machine breakdown or sub-standard materials.

Suri (2010) identifies two types of variability, dysfunctional and strategic. Dysfunctional variability is similar to the abnormal variability cited by Anupindi and "is caused by errors, ineffective systems, and poor organisation. Examples of dysfunctional variability are: rework, constantly changing priorities and due dates, and lumpy demand due to poor interfaces between sales and customers" (p4). This type of variability should be eliminated. Strategic variability however refers to variability that may supply a competitive advantage, for example the ability to cope with unexpected changes in demand or the ability to offer the customer more choice. Suri argues that the lean approach aims to eliminate all variability but that organisations should discriminate and retain variability that delivers an advantage. Lean (The Toyota Production System), however, as explained by Ohno (1988), is really only trying to eliminate variability that generates waste. Suri and Ohno both recognise the value of retaining spare production capacity to maintain flow when there is a variation in the arrival volume or processing time of jobs.

Seddon (2005) argues that service processes experience much greater variety than manufacturing processes because the customer is involved as a co-producer. Seddon takes his inspiration from Ohno and the Toyota Production System and adapts principles of systems thinking and system dynamics to services, specifically a form of service factory he calls the service centre (call centre). He identifies two sources of variation, demand and flow. Customer demand varies by type and frequency of type, flow refers to the capability of the system to handle the demand. Seddon (p61) asserts that "by revealing variation we invite questioning of its causes."

The following sections will show that it is neither possible nor desirable for services to achieve the reductions in variability sought by manufacturing. The low unit volume of hospitality services also means that the costs of reducing and controlling some types of variability may simply be too high.

2.6.3: Sources of variability

Customer-introduced variability and internal process variability are the two basic types of variability (Bicheno, 2008). Internal variability is found in the activities and resources (labour, equipment and materials) that the organisation brings to the process.

Variability affects throughput time and the level of effective capacity. Armistead and Clarke (1994) (see figure 2.2) present a capacity management model and group variability by service load and capacity leakage. The article does not explain in any detail what they mean by the terms. Table 2.2 below interprets the terms to suit the nature of the study.

Service Load	
Service variety	The range of tasks or activities that may be available, each of which may require different resources from different locations.
Variation in demand	Lumpy arrival patterns leading to variations in capacity utilisation and possibly queues. Variation in customer behaviour as suggested by Frei (2006).
Resource absorption per service	The nature of a service task or actions of the customer that result in varying time requirements for part or all of a process.
Demand management	The effectiveness of any demand management strategies in matching demand with capacity.
Capacity Leakage	
Labour lateness / absenteeism	Insufficient labour resulting in reduced effective capacity and perhaps bottlenecks.
Quality failures	Imprecise equipment, substandard materials or employee errors, perhaps due to lack of training or insufficient operating procedures.
Scheduling losses	Demand cannot be satisfied due to late delivery or shortage of materials, equipment shortages or breakdowns.
Labour underperformance	Varying knowledge, motivation or capability of the workforce.
Change-overs	Capacity unavailable while it is prepared for the next customer.

Table 2.9: Sources of variability affecting capacity.
Adapted from Armistead & Clarke (1994).

Sources of variability in table 2.3 can be grouped by source. Service variety (at least partly), resource absorption per service and change-overs can be viewed as originating in the design of the task, activity or process. All capacity leakage (including change-overs) can be viewed as originating in the capacity resources. Variation in demand can be viewed as originating with the customer. Demand variation can also result in varying demand for particular services and varying resource absorption per service.

A distinction needs to be made between variety and variability. Variety refers to the range products and services provided by the operation, each of which may consume varying amounts of resources, including time. Customers may also demand a variable number of products or services, a customer with fewer demands will occupy capacity for less time. Some services are similar to the 'all-you-can-eat' buffet concept, where the organisation places no limit on the number of requests at each service encounter or the number of times that the customer can return to the service point. The variation due to variety is therefore customer request variability. Where the variety on offer is sequential (this and that) rather than parallel (either or) time will be added to the process.

Variety can be seen as a compensation for self-service. In exchange for doing some of the work customers are rewarded with a wider variety of product choice and given more freedom to consume.

Customers often take part in the process as a co-producer and are perhaps the source of the greatest amount of variety and are the least controllable source. Frei (2006) identifies 5 types of customer variability in service processes;

- Arrival variability: Arrivals may follow a pattern but guests arrive when in suits them.
- Request variability: Variation from the standard service or product and varying demand for the number of products or services.
- Capability variability: Abilities of customers vary with knowledge, skill or physical ability. This is particularly important where the customer is a co-producer.
- Effort variability: Different customers are willing to put in different amounts of effort as co-producers.
- Subjective preference variability: Derives from a subjective opinion and valuation of the different elements of a service.

The first four types identified by Frei have an impact on waiting and process times. Effort variability refers to the amount of work that a customer is willing to do themselves and affects their preference for service method, as some customers would rather wait to be served than do the work themselves. This categorisation is helpful but, unless the customer is questioned, it may be unclear whether an action is due to a preference not to exert effort or a lack of capability. Likewise a preference to be served in a certain way may exhibit itself in an increased number of requests.

If an appropriate throughput time is to be achieved and maintained an organisation needs to consider how it is going to deal with variety and variation.

2.7: CONCEPTUAL FRAMEWORK

Figure 2.9 illustrates the causal links underlying the thesis. Variability in arrival and processing time can be due to behaviours of the customer or the system, variability causes variable demand for capacity. In order to cope with variable demand capacity must also vary, either by addressing the volume of available capacity or the amount of time consumed by operator activities. Over time the operator needs to select and develop tangible resources that have the competences and capabilities to achieve the process objectives. There are limits to the reduction of process duration, customer satisfaction must be maintained.

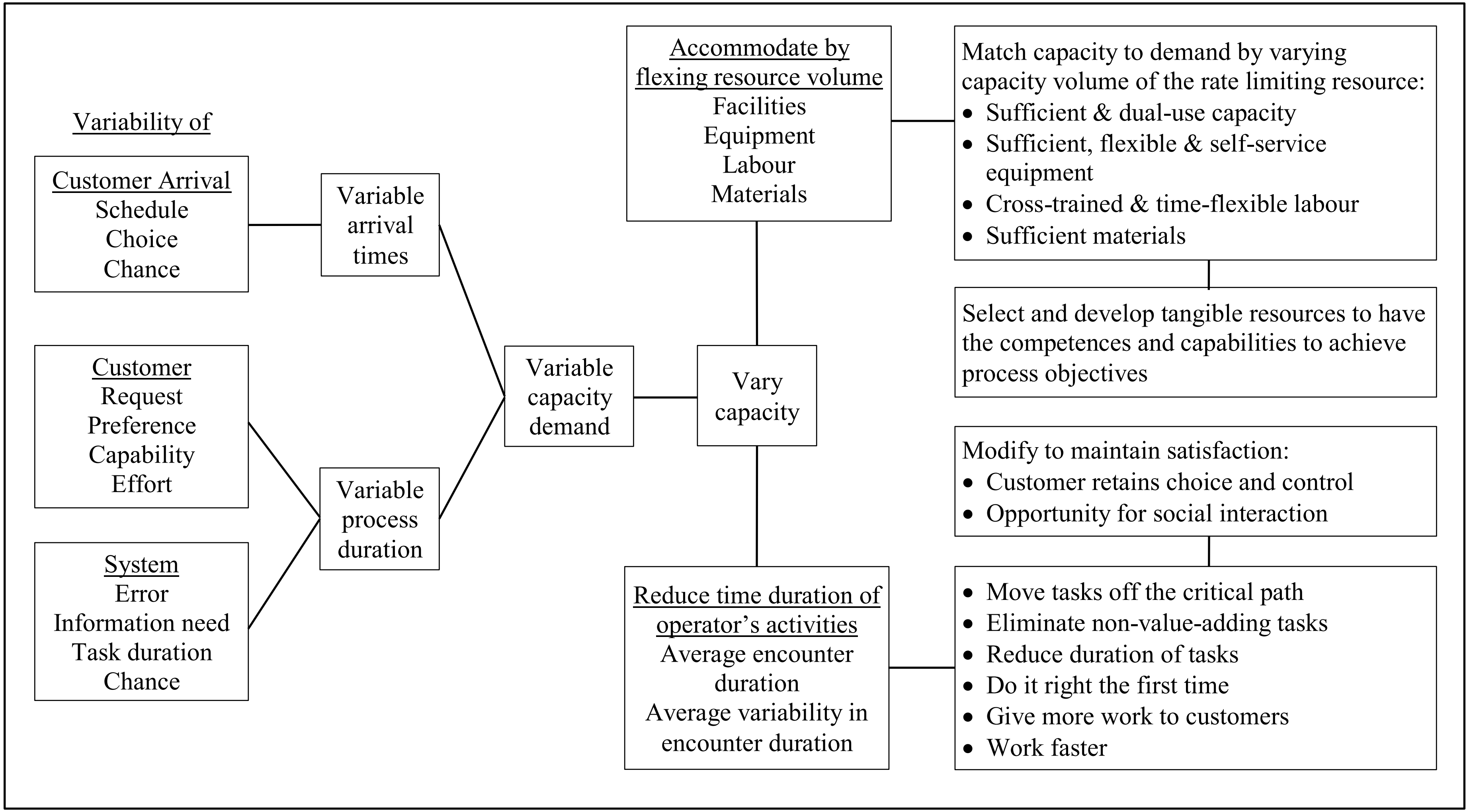

Figure 2.9: Key Causal links to achieve appropriate throughput time.

2.8: SUMMARY

This chapter has set out a view of the organisation as a system of interrelated activities and processes through which objects flow and are transformed either by the resources of the organisation or, if human, by themselves with the help of organisation resources. The arrival times and processing times of flow units is not uniform resulting in uneven demands on resources and processes. Theories have been discussed that suggest how activities and resources may be configured to cope with this variability so that customers flow at a rate that is appropriate to their desires or needs.

CHAPTER 3: METHODOLOGY

3.1: INTRODUCTION

The aim of this research was to explore what theory says about how resources and processes can be configured to achieve appropriate throughput time or to quickly adapt to cope with short term increases in demand and to investigate the actual tactics used in hotels. The review of literature has emphasised the role of variability in affecting throughput time. To achieve the aim it was necessary to visit hotels, observe processes, talk to employees and read internal documents. This chapter will justify the use of the case study research strategy and consider issues of validity, reliability and generalisability of findings.

Scientific research seeks "the causes of effects, events or phenomena" (Punch, 2005; 48). The aims of social science are "the development of a 'scientific' objective, propositional knowledge which provides a coherent description and explanation of the way the social world is" (Sayer, 1992; 233). Explanations are incomplete and open to revision; the social objects studied are constantly changing (Sayer, 1992). One way in which knowledge is developed is through work (Sayer, 1992), human activity is the practical application of knowledge to "transform, modify, move or manipulate any part of nature" (Sayer, 1992; 17). Humans learn through doing, learning is a form of change. This research records some events and offers an explanation for them through the lens of operations management theory. Perhaps the way work is carried out can be explained by theory, or perhaps it has something to add to theory.

Punch (2005) argues that “the methods we use follow from the questions we seek to answer” (p20), while Sayer (1992) says “what (method) is or isn’t appropriate can only be decided by reference to judgements about the nature of the thing to be explained” (p232). The words used in the research question suggest an approach, words such as ‘variables’ and ‘factors that affect’ suggest a quantitative approach, whereas words such as ‘seek to understand’ and ‘explore a process’ suggest a qualitative approach. Punch argues that even when the question is qualitative there may be occasions when researcher constructed measures, such as rating scales, may have a role in the research. He advises that, a decision should be taken on a case by case basis and suggests that a decision to reject the validity of all quantitative methods may disadvantage the research. Sayer suggests that the nature of the objects means that social sciences are studying systems that are not closed; single facets cannot be isolated and studied under laboratory conditions. Social sciences are internal to the object that they are studying, the subject of study usually involves people whose “causal powers are considerably more diverse and changeable (even volatile) than those of non-human objects” (Sayer, 1992; 234). Humans are self-interpreting and their actions are context dependent. Any explanation therefore is incomplete and knowledge is constantly revisable.

This research seeks to explain events through retroduction. “Events are causally explained by retroducing and confirming the existence of mechanisms, and in turn the existence of mechanisms is explained by reference to the structure and constitution of the objects which possess them” (Sayer, 1992; 235). The explanation for mechanisms is to be found in the nature of the objects that produce the events or in the conditions created when the objects are placed together. Events are outputs or outcomes of activity. Inputs have an effect on each other and cause the event. Processes consume chronological time, the cycle time of the process is dependent upon the time it takes for the constituent activities to be completed. Changes to the number of serial activities and the duration of activities on the critical path will therefore affect process cycle time. Arrival time and throughput time are variable in the processes under investigation, generally customers arrive at a time that suits them and their needs will affect the demands that they place on the system and the amount of time that they remain in the system. Flexible capacity is required to absorb demand variation if the customer is not to be kept waiting. The research aims to explain what hotels do with their processes and capacity in order to maintain an acceptable throughput time for the customer.

Voss et al (2002) review the use of case studies in operations management research. They point out that operations management addresses both the physical and human elements of the organisation and proceed to assert that most research methods are quantitative, acknowledging that the construction of theory based on quantitative data requires interpretation (qualitative understanding). They suggest that case studies can have different purposes; exploration to uncover areas for research; theory building in which key variables and their linkages are identified; theory testing; and theory extension / refinement to better structure theories in the light of results. Different research methods are suggested.

This chapter will argue that Critical Realism as expounded by mainly by Sayer (1992, 2000) offers an interpretation of knowledge and reality that is appropriate for managers of operations. Critical Realism also provides an underpinning and convincing justification for the use of the case study method to contribute to an understanding of the causes of events. Later the design and implementation of the case studies will be explained and justified.

Secondary research has expounded a particular view of the nature of business processes in operations and highlighted the nature of hotel operations that involve the customer. The causal mechanisms of process time have been explored and reported tactics for dealing with variability to keep process time to an acceptable level have been identified. The role of primary research is to investigate the extent to which theory can be observed in a particular context. It seeks to explain practice in the light of theory discussed and suggest changes to processes so that they better achieve time objectives.

3.2: KNOWLEDGE AND REALITY

A doctoral thesis is required to represent an original contribution to knowledge. Much time and paper has been consumed in the discussion of the nature of both knowledge and reality. This research seeks to answer a question situated at the operational end of a business organisation, the point where the product or service is created by the practical application and transformation of knowledge and resources. Something is produced through an interaction of information, materials and customers with the capital and labour of the organisation. Any claim to knowledge therefore is knowledge of a type that is useful to managers of operations, useful in the sense that it informs them about ways in which they can organise their resources and processes to improve efficiency and effectiveness.

Lundberg (2004) suggests that both managers and scientists are trying to understand how and why something works or not. The main difference is that managers are interested in pragmatic solutions that tell them what they need to do in order to achieve their goals, whereas scientists are looking for descriptions of the world. A better theory is seen as one which is based on more sophisticated frameworks, that is more nuanced and situation dependent. It develops over time as the solutions it suggests are closer to the outcome that the manager seeks. Cavaleri (2008) argues that much management theory is pragmatic, about finding out what works best in practice, and that the influence of important management thinkers, such as Deming can be traced back through Lewis and Dewey to the ideas of Charles Sanders Peirce (1839-1914). According to Dewey (1916) Pierce considered that doubt creates an uneasy state that stimulates enquiry so that we can return to our state about what we believe to be true in the world. In a sense knowledge is what we believe, with some justification, to be true about the world (Boisot & MacMillan, 2004) and, in management at least, it is a belief that works when put into practice.

Knowledge can make a difference to the actions of an individual and is often expressed in action (Tsoukas & Valdimirou, 2001). For organisations the knowledge of how to do something so that a predetermined objective is achieved is useful knowledge. Tsoukas & Valdimirou define organisational knowledge as "the capability members of an organization have developed to *draw distinctions* in the process of carrying out their work, in particular *concrete contexts*, by enacting sets of generalizations (*propositional statements*) whose application depends upon historically evolved *collective understandings* and experiences" (p 983, authors' italics). New knowledge is about learning to make sense of our perceptions (Polanyi, 1962). Deeper insight and ever more sophisticated theoretical explanations of a topic of interest advance the understanding of organisational knowledge (Tsoukas & Valdimirou, 2001).

Knowledge can be thought of as a means of doing things in the world rather than as a representation of the world (Sayer, 1992). Practically adequate knowledge "must generate expectations about the world and about the results of our actions which are actually realized" (Sayer, 1992; 69). Practical adequacy varies according to context. Better knowledge in the context of operations is that which, when applied, results in a movement towards achieving or exceeding the desired outcomes of the process. By identifying and explaining the necessary and contingent connections between cause and effect this research will better explain how managers can manipulate and control the system so that it delivers appropriate throughput time.

What people believe to be real affects the way that they act. For business managers this is more important than whether experiment can provide proof of the existence of a phenomenon, "something is real if it has an effect or makes a difference" (Fleetwood & Ackroyd, 2004; 29). There are different modes of reality, Fleetwood (in Fleetwood & Ackroyd, 2004) suggests that there are at least four (see table 3.1). There are materially real objects that exist in the natural world and would continue to do so even if humans were not here to experience them. These objects have no intrinsic meaning but often humans attribute significance or meaning to them, for example, different flowers have different social meanings in different societies. Materially real objects are processed by humans and turned into artifactually real objects that are conceptually mediated, these are the objects that have a purpose or use for us such as tools, equipment, clothes and furniture. They exist in physical form but also have no intrinsic meaning. Ideally real entities are defined as discursive; the language, symbols and theories that humans use to represent and communicate their understanding of the world. Socially real entities refer to social practices and structures, they have no material reality but they exist independently of any individual. The delivery of products and services in hospitality involves objects that fit all four descriptions of modes of reality. Material objects have powers and liabilities that are almost entirely predictable and unchanging over time, though some natural variation is present in the quality of raw materials and in the operation of equipment. People impose meaning on and extract it from objects and situations, so service applies social knowledge as well as technical knowledge.

Materially real	The natural world of tangible objects.
Artifactually real	Buildings, furnishings, fittings, equipment, tangible flow units
Ideally real (discursive entities)	Communication, theory, explanation
Socially real	Hotel, customer & server, subordinate & supervisor, policies, objectives, laws, time

Table 3.1: Examples of modes of reality.

Meaning is inter-subjectively negotiated and changes over time, people are reflective and heterogeneous in terms of their values, knowledge and ability. Experiences are often given meaning and judgements are made about the degree of satisfaction with the experience. An experience that has different meanings in different cultures or situations indicates that the meaning is socially negotiated rather than derived from the physical nature of the person. Services marketing literature tends to focus much more on how the processes and outcomes of an organisation impact on the customer and their interpretation of the experience.

Observation is ‘conceptually saturated’ (Sayer, 1992). A world separate from human experience exists, some of it is capable of being sensed but only a small part actually perceived and conceived. Humans need to make sense of the world and this is done through conceptual filters. Thus two people may receive the same sensations but interpret them differently depending upon their conceptions of the world (Archer in Lawson et al, 2007). A human resource manager, in other words, may pay attention to different information and interpret a situation differently to an operations manager. Customers perceive service quality and make judgements by comparing expectation with perception. Different customers have developed different expectations based on their personal values, knowledge and previous experiences. In addition different characters mean that different customers have different levels of tolerance to variations in service quality (Wilson et al, 2008). Humans are reflective and their course of action is not determined, empirical investigation uncovers tendencies rather than certainties (Archer in Lawson et al, 2007).

3.3: RETRODUCTION

If humans waited for certainty before they acted then little action would take place. Thus action is on the basis of either what is believed to be true or what is thought to be practically adequate. Because the world is an open system few circumstances are identical and thus when theories are applied the outcome may not always be as hoped or predicted. The more that a system is open, the harder it is to predict the events that will be generated by the interaction of the objects, thus, "The use of a recommended strategy does not guarantee the achievement of a goal" (Simon, 1973; 474).

Retroduction (sometimes called abduction) can be traced back to the ideas of Charles Sanders Peirce. "Induction is an inference from a sample to a whole, while abduction is an inference from a body of data to an explaining hypothesis. … Induction is the method of testing hypotheses, whereas abduction includes the method of discovering them" (Burks, 1946; 301). Induction suggests that the more frequently events have been observed in the past the more probable it is that they will occur together in the future (Bertilsson, 2004). Induction reflects the natural tendency to assume that a conjunction of events will continue and that this is sufficient in terms of an explanation. Probability, however, is just an expression of likelihood and does not contain any explanation of causes. Risk management may talk about the likelihood or probability of outcomes but suggests that it is the causes of the event that need to be identified and treated (Lewis, 2003). Sayer (1992) defines retroduction as "The mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them" (p107). The explanation for events is not found in the frequency with which variables occur together but in the conditions created when the powers and liabilities of objects come together. Management selects objects (resources) and creates conditions (system of production) with the aim of controlling the outcome, or event. Essentially retroduction works back from the event to identify the causal mechanisms and conditions deriving from the interaction of the nature of the objects. Operations managers also start from the desired outcomes and work backwards to make decisions about the selection and configuration of resources that, in their understanding, will produce the desired outcomes.

It is possible that an outcome can be achieved, or explained by different mechanisms, especially in very complex open systems where the path of causality may be difficult to trace

(George & Bennett, 2005). This makes it very difficult to establish generalised laws in social sciences. Business consultants and academics continue to offer differing and competing solutions for businesses, each claiming to be a better explanation of how the organisation can be changed to better achieve the strategic goals. The theories offered, however, are an abstraction, a simplification to common features of the contexts from which they were formulated. When these theories are then applied to a new context they may not work as expected because social systems are more heterogeneous than the generalised theory indicates. The exposure of systems to a large number of factors that are themselves not immutable means that explanations offered may only achieve partial or temporary utility. At the operations level the system is less open, exposed to fewer factors, outcomes of events are closer in time and space to the mechanisms that generated them, causality is less controversial.

What an object can or cannot do is dependent upon its nature. It is a necessary feature of the object. What the object actually does is dependent upon how the nature of other objects affects it. Sayer (1992) calls these latter conditions 'contingent'. The front desk clerk in a hotel has necessary powers (and liabilities) as a human being and is acting in an accepted role that places limits and expectations on behaviour. The ability to take on that social role and learn the competencies is a necessary feature of the person and the role. The role and the learned behaviours are not expressed until a guest arrives, creating the conditions in which the clerk's powers are exercised. Taking an example from non-human objects, the oven by its nature has the power to heat (and the liability to burn) and bread dough has the power to be transformed by heat into bread (under the right conditions). Sayer (1992) expresses this in a diagram (p109 and see table 3.2) as Object 'X' having structure 'S', necessarily possessing causal powers (p) and liabilities (l), under specific conditions (c1) will produce event 'e1', while conditions (c2) will produce event 'e2', etc. The causal powers are expressed as causal mechanisms, or "ways-of-acting" (Sayer, 1992; 105).

Type 'A' tests Causal (necessary) explanations		Type 'B' tests Contingent explanations	
Object	Causal powers and liabilities	Conditions (other objects with powers and liabilities)	Events
An object has a certain structure	That necessarily possesses named causal powers	Which under specific conditions	Will: 1. Not be activated and hence produce no change 2. Produce this change under these conditions 3. Produce a different change under other conditions

Table 3.2: Evaluation or testing of causal hypotheses (Sayer, 1992; 213).

The aim of retroduction is not to predict when an event will happen but to offer an explanation of how it happens when it does (Sayer, 1992). Verification of a causal explanation is to be achieved by identifying the objects, their properties and their ways of working (mechanisms). Explanatory evaluation of events in social sciences can be easier than in natural sciences because "we have 'internal access' through practice to many structures and mechanisms, and reasons and beliefs similar to our own may function as causes. Transitive verb causal explanations are particularly open to check. Much more difficult are causal explanations in which it is claimed that reasons function as causes" (p214).

3.3.1: Causal mechanisms

Causal mechanism have been discussed at length in both sociology and political science (McAdam et al, 2008) and mechanisms as explanation have "the same ontological dignity as correlation" (p308). George and Bennett (2005) define causal mechanisms as:

> "ultimately unobservable physical, social, or psychological processes through which agents with causal capacities operate, but only in specific contexts or conditions, to transfer energy, information, or matter to other entities. In so doing, the causal agent changes the affected entity's characteristics, capacities, or propensities in ways that persist until subsequent causal mechanisms act upon it." (p137)

The definition of processes offered by Palmberg (2009) as "A horizontal sequence of activities that transforms an input (need) to an output (result) to meet the needs of customers" (p208), and the observation by Armistead (1995) that processes utilise facilities, materials information and people indicates that there is great similarity between the concept of a business process and a causal mechanism. Mechanisms are the events that link effects to cause (McAdam et al, 2008). The purpose of a business process is to effect change in a planned and controlled way to achieve pre-determined outcomes. Business processes can be viewed as causal mechanisms designed and managed to produce events with consequences that achieve the planned outcomes.

Traditionally an aim of research has been to find the "causes of effects, events or phenomena" (Punch, 2005: 48). Essentially the aim of this research is to explain throughput time. Sayer (1992: 107) defines retroduction as a "mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them". The essential event is process duration. Bunge (2004: 203) asserts that "*to explain is to exhibit or assume a (lawful) mechanism.* This is the process – whether causal, random or mixed – that makes the system work the way it does". The process is the mechanism that 'transduces' the input into the output (Bunge, 2004: 201). Similarly McAdam et al (2008: 309) describe mechanisms as "transforming events". Anderson et al (2006: 103) assert that "mechanisms explain how and/or why one thing leads to another". Thus the activities that comprise a process can be regarded as the mechanisms that explain how the input variable was transformed.

The mechanisms are an expression of the powers of the objects involved. Successful baking, for example, cannot take place without the power of an oven to generate heat to a chosen temperature and maintain that temperature for a required duration. "We try to get beyond the recognition that something produces some change to an understanding of what it is about the object that enables it to do this" (Sayer 1992: 106). This research therefore attempts to understand the nature of the objects that affect and effect process duration. To do this is to assume something about the nature of reality and what constitutes knowledge (explanation).

Operations research is generally functional, publishing quantitative based studies that expose correlations but do not investigate causal mechanisms. Quantitative tools such as correlation expose the frequency with which two variables occur together but do not supply an explanation. “mechanisms allow us to see beyond the surface-level description of a phenomenon. If we observe two variables, X and Y and some association between them, we know little more than that X and Y are correlated. Does X cause Y? Does Y cause X? Or are we observing a spurious correlation between the two brought about by a third unobserved variable, Z? Answering this question requires one to move beyond studying the X-Y relationship to addressing the question of why and how the relationship occurs.” Anderson et al (2006: 103).

For a process to be regarded as useful its parts must be assembled in a thoughtful way so that it can be said that they cause, or generate, the desired output or outcome. It is this generative interpretation of causation as explained by Sayer (1992) that is used to help explain events. Transitive verbs provide causal descriptions, accounts of what generated change: for example, ‘the desk clerk *checked in* the customer’. Check-in is an action that represents a change in the status of the customer from someone without position in the hotel to an in-house guest. The causal power to execute the action is to be found in the structure of an object. An exercised power or liability is called a mechanism (Sayer, 1992). The social positions of customer and server need to be recognised and accepted by those in the situation. Society has negotiated (and continuously renegotiates) the meaning of these roles and assigned an acceptable range of behaviours to each. Thus social positions can express a range of powers that are necessary to that role. The individual adopts different roles in different situations.

The mechanism is triggered by an event, such as a customer request for service. If the process is to be controlled and predictable it is important to distinguish between the mechanisms exhibited by necessity because of the nature of the objects and those generated by the presence of other objects unique to the particular context or situation (Sayer, 1992). Non-human objects have limited and identifiable powers. Generally in operations these objects can be arranged and controlled to exhibit the desired powers in a predictable way. Humans are much more complex and can behave or interact in undesired or unpredicted ways. The range of possible contingent behaviours can make processes involving them much less predictable.

The aim is not to arrive at an 'objectively true for all time' explanation of throughput time, a set of principles that when applied will always deliver the required throughput time. The nature of human action as being subject to free will precludes this. The aim is to suggest how an understanding of the nature (powers) of objects and their ways of behaving (mechanisms) can be applied practically to create conditions that suggest that the desired outcome will occur. A view of knowledge is adopted that fits with the attitude of working managers, as something that is practically adequate, until something even more adequate is suggested.

3.4: ABSTRACT AND CONCRETE: INTENSIVE AND EXTENSIVE

Abstract research studies structures and mechanisms while empirical generalisations are established by seeking to identify regularities and common properties in a large number of real life events. Concrete intensive research studies a small number of real life events and uses retroduction to identify mechanisms and structures that explain the events (Sayer, 1992). An abstraction "isolates in thought a *one-sided* or partial aspect of an object" (Sayer, 1992; 87). This research represents a partial view of the desirable outcomes of process performance and in that sense it is abstracting from the concrete world. Appropriate waiting (or throughput) time is just one process outcome sought by customers. In many circumstances delays may be a minor irritation rather than a major factor in judgements of satisfaction. The influences and properties of objects that deliver throughput time are "isolated in thought by means of abstraction, as a first step towards conceptualising their combined effect" (ibid; 87). Understanding concrete events involves deconstructing the concrete, examining it and recombining it.

Abstractions help to distinguish between "'*substantial*' relations of connection and interaction and '*formal*' relations of similarity or dissimilarity" (op cite; 88). Substantial relations here indicate a material connection between objects where one object has a direct effect on another or passes something between them, such as the customer passing information to the server. Another form of relation is described above as necessary (internal) or contingent (external). The relation between the role of customer and server is necessary because one depends on the other. The role of server requires customers and customers require servers (generally). The relation between customers is contingent. It is neither impossible nor necessary that, for any particular customer, other customers exist. The relationship between customers can also be either formal or substantial. Customer behaviour may have a direct effect on other customers and thus have substantial relations, but when customers are analysed and put into market segments their relationship is formal. Substantial relations, therefore, indicate a causal relationship, but the powers expressed may derive either from the internal and necessary nature of the object or from the contingent and external presence of powers of other interacting objects.

The reason for considering relations is to answer questions such as "What does the existence of this object (in this form) presuppose? Can it exist on its own as such? If not what else must be present? What is it about the object that makes it do such and such" (op cite; 91). Relations help identify whether causal mechanisms lie in the nature of the objects or the contingent conditions created by the presence of other objects.

	Intensive	Extensive
Research question	How does a process work in a particular case or a small number of cases? What produces a certain change? What did the agents actually do?	What are the regularities, common patterns, distinguishing features of a population? How widely are certain characteristics or processes distributed or represented?
Relations	Substantial relations of connection	Formal relations of similarity
Type of group studied	Causal groups	Taxonomic groups
Type of account produced	Causal explanation of the production of certain objects or events, though not necessarily representative ones.	Descriptive representative generalizations, lacking in explanatory penetration.
Typical methods	Study of individual agents in their causal contexts, interactive interviews, ethnography. Qualitative analysis.	Large-scale survey of population or representative sample, formal questionnaires, standardized interviews. Statistical analysis.
Limitations	Actual concrete patterns and contingent relations are unlikely to be representative, average, or generalizable. Necessary relations discovered will exist wherever their relata are present, e.g. causal powers of objects are generalizable to other contexts as they are necessary features of these objects.	Although representative of a whole population, they are unlikely to be generalizable to other populations at different times and places. Problem of ecological fallacy in making references about individuals. Limited explanatory power.
Appropriate tests	Corroboration	Replication

Table 3.3: Intensive and extensive research: a summary. (Sayer, 2000; 21).

Table 3.3 Summarises the differences between extensive and intensive research as adapted by Sayer from the work of Harré. Discussions so far clearly indicate that the appropriate approach to research here is intensive rather than extensive. This model indicates that causal explanations are best established in social research by looking at a particular case or a small number of cases, therefore the case research method will be used and a qualitative approach will mainly be applied.

3.5: METHODS AND APPLICATION

3.5.1: Case research

The case study approach can be viewed as a research strategy (Eisenhardt, 1989; Verschuren, 2003; Yin, 2009; Punch, 2005; Easton, 2010). Verschuren (2003; 122) states that a research strategy refers to "a coherent set of methods, techniques and procedures for generating and analysing the research material as well as to the way the researcher looks at reality and conceptually designs the research project". Punch and Verschuren suggest that a case has a holistic focus, looking at a case in its natural setting "aiming to preserve and understand the wholeness and unity of the case" (Punch, 2005; 144). Yin (2009) is frequently cited in articles about case study method, his book "Case study research: design and methods" was first published in 1984. The preface to the 4th edition, published in 2009, makes reference to the ideas and contributions of numerous academics that have been incorporated into the text. Although authors continue to cite and debate slight variations in the definition of what case research is, Yin's definition will be used here:

> "A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomena and context are not clearly evident" (Yin, 2009; 18)

The key point is that a phenomenon, throughput time, is being examined within its real life context, in this research the context is mid-market hotels in one part of the UK. Case studies are particularly useful where contextual conditions may be pertinent to what is being studied (Yin, 2003). This is in contrast to experiments which try to create a closed system in which objects are isolated from 'extraneous' influences. Businesses operate open to many powers and liabilities, examining events in context is clearly what this research intends to do, so it seems that the case approach is a relevant strategy to adopt. Context "is vital for explanation" (Sayer, 1992; 248) as it contains the objects that create the conditions that realise the events - it may be the key to explaining why a particular event occurred.

Case studies have been used in operations management for a number of purposes and they provide:

- An understanding of the conditions under which theory is applicable (Stuart et al, 2002).
- Evidence of causal relationships through direct observation (Stuart et al, 2002).
- A critical means for examining time dependent relationships (Stuart et al, 2002).
- The possibility of studying a problem in great detail (Easton, 2010).
- Develop new ideas by working in close contact with multiple case studies (Voss et al, 2002).

- Investigating explanatory ‘how’ and ‘why’ questions (Voss et al, 2002).
- It is an all-encompassing method covering the logic of design, data collection techniques and specific approaches to data analysis (Xiao & Smith, 2006).

A concern about case studies highlighted by Yin (2009; 14) is that “too many times, the case study investigator has been sloppy, has not followed systematic procedures, or has allowed equivocal evidence or biased views to influence the direction of the findings and conclusions.” He suggests how four design tests (table 3.4) can be applied to judge the quality of case study research. These will be discussed in the sections following.

Tests	Summarised description of test	Case Study Tactic	Phase of research in which tactic occurs
Construct validity	Establishing correct operational measures for the concepts being studied	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study report	Data collection Data collection Composition
Internal validity	For explanatory or causal studies, establishing causal as distinguished from spurious relationships	• Do pattern-matching • Do explanation-building • Address rival explanations • Use logic models	Data analysis Data analysis Data analysis Data analysis
External validity	Establishing the domain to which a study's findings can be generalized	• Use theory in single-case studies • Use replication in multiple-case studies	Research design Research design
Reliability	Demonstrating that the operations of a study can be repeated, with the same results	• Use case study protocol • Develop case study database	Data collection Data collection

Table 3.4: Case Study Tactics for Four Design Tests (adapted). (Yin, 2009; 41).

3.5.1.1: External validity

Mid-market hotels have similar standards and working practices wherever they are located in the UK. Branded hotels strive to implement common practices across hotels within the brand. Hotels have been selected for convenience but from different brands. Replication refers to the ability to repeat the methods by which the research was conducted. It does not mean that the findings of the research are necessarily identical between cases. Yin (2009) suggests the development of a research protocol that can be followed in each case, or used by other researchers wanting to replicate the research.

One desired outcome of research is that the findings should produce some theory or generalisations that can be applied to other similar cases or contexts. One frequent criticism of cases studies is that the small number of cases studied means that the findings are not generalisable (Verschuren, 2003; Yin, 2009). This criticism assumes that causation is established by examining the frequency with which variables occur together. When causation is viewed as being rooted in the necessary nature of the objects and their contingent relations the need to examine large numbers of cases disappears. The goal of case studies is to "expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization)" (Yin, 2009; 15).

Theory presents a simplified or abstracted view of situations, by seeking similarities and regularities it must abandon some of the contextual conditions of open systems that may have played a part in generating the outcome. "Abstraction seeks necessary relations, conditions and properties and does not expect to find successful generalizations at the concrete level" (Sayer, 1992; 239). Causal mechanisms often do not produce empirical regularities due to the complexity of open systems. By their nature open systems are open to variability, a key factor in affecting throughput time. The extent to which case findings may be similar or point to generalities will depend partly therefore on exactly how open and complex the systems are. A key goal of the research must be to distinguish between necessary (internal) relations and contingent (external) relations.

The summary of intensive research in table 3.3 suggests corroboration rather than replication as a test. Sayer (1992) describes this as a within-case activity of checking "with others in the same institution to corroborate information about common practices" (p246). In this sense it is more closely related to construct validity as described in table 3.4.

3.5.1.2: Construct validity and reliability

Construct validity and reliability are established largely through the collection and recording of data. This refers to the choice of data, its collection method and how it is stored.

A case study protocol was used in preparation for and during data collection, it made explicit what information was being collected and the procedures and rules that were to be followed (Yin, 2009). The purpose of this was to improve the consistency with which multiple cases were explored and allow a subsequent researcher to repeat the research. The protocol should have the following sections (Yin, 2009; 81):

- An overview of the case study project (project objectives and auspices, case study issues and relevant readings about the topic being investigated.
- Field procedures (presentation of credentials, access to the case study 'sites', language pertaining to the protection of human subjects, sources of data, and procedural reminders).

- Case study questions (the specific questions that the case study investigator must keep in mind in collecting data, ‘table shells’ for specific arrays of data, and the potential sources of information for answering each question.
- A guide for the case study report (outline, format for the data, use and presentation of other documentation, and bibliographical information).

There are six sources of evidence for case research; documentation, archival records, interviews, direct observations, participant observation and physical artefacts (Yin, 2009). Documents, interviews and direct observation are used here. Documents recording objectives and procedures represent a codified form of knowledge accessible to all. Tacit knowledge, representing craft knowledge and experience, is not recorded and needs to be discovered through questioning and observation. Direct observation of the processes is required to record whether the documented and tacit knowledge is put into practice. In addition the observation of practice may reveal tactics that were not revealed by documentation or interviews. Practice needs to be observed to assess whether there is a causal link between and action or arrangement of resources and throughput time.

A more detailed discussion of the data to be collected and a copy of the research protocol can be found a little further on in this chapter.

3.5.1.3: Internal validity

Internal validity is established by the way in which data is analysed. It is of particular concern in explanatory studies where an attempt is being made to identify causal relationships (Yin, 2009). It is, therefore, of particular relevance for this research. Case study research is time consuming so usually only a small number of cases are examined. A case can be valid even if its findings cannot be generalised when internal validity is demonstrated by persuasively arguing a causal connection (Sayer, 2000).

It is argued that the particular view of knowledge and reality discussed above provides a basis for establishing internal validity. A process is an event that takes place over time, the constituent parts are put together on the basis that they cause an effect that moves the process towards achieving its objective. Patterns of cause and effect are established. Yin (2009) suggests the use of an organizational-level logic model as an analytical technique. The logic model "stipulates a complex chain of events over an extended period of time. The events are staged in repeated cause-effect-cause-effect patterns, whereby a dependant variable (event) at an earlier stage becomes the independent variable (causal event) for the next stage" (p149). This is similar to process-tracing which "focuses on sequential processes within a particular historical case, not on correlations of data across cases" (George & Bennett, 2005; 13). An assumed property of reality is that time is unidirectional, prior decisions or events affect the range of subsequent decisions or events that may occur. As a simple example, a fast-food kitchen is designed to efficiently produce a certain type of food and could not be used unchanged to regularly produce food of a Michelin star standard. A hotel designed for the budget market could not be easily converted to a luxury hotel simply because of the bedroom sizes.

The main focus for this research is day to day operations where the causal effect can generally be observed immediately. Yin (2009) suggests explanation building as a suitable technique, "To 'explain' a phenomenon is to stipulate a presumed set of causal links about it, or 'how' or 'why' something happened." (p141). The findings of research are analysed using existing theory about the nature of processes derived from peer reviewed publications and academic publications from reputable and long established publishers.

The intensive approach to research suggests that corroboration is an appropriate test. Sayer (1992; 246) describes an example of what he means by corroboration: "if an intensive study of an institution were based on interviews we might want to check with others in the same institution to corroborate information about common practices". It was proposed that at least four staff in each hotel and process would be interviewed; two customer servers, a supervisor and the departmental manager. Unfortunately this number of staff was not always available. Documents such as Standard Operating Procedures provide another form of corroboration. They represent a codification of how the organisation thinks the processes should be carried out in order to meet the performance aims. Conformance to standards is often assessed by mystery customers and the level of conformance fed back to staff. It was found that Standard Operating procedures sometimes did not exist or were generally not referred to in practice. Looking back on the research experience, it can be seen that these documents were regarded more as guidelines; actual service delivery needed to adapt to the needs of the situation and customers present.

Different methods can reveal different perspectives on a phenomenon, "Indeed, different methods can be seen to be necessary to reveal different aspects of the constituency of phenomena, that is their ontic character, as structural, that is cause and effect, relations more broadly. Thus, the concept of cause in Critical Realism is tied to emergence from the interaction of human agency and institutions or structures. In this regard, the motivational (or otherwise) dimension of agency needs to be elaborated, as well as the mechanisms that facilitate action, or behaviour, coupled with the relational context of that behaviour. Each of these components clearly requires different methods of analysis to reveal their nature and action." (Downward & Merriman, 2007; 91)

Examining more than one case provides the opportunity for cross-case analysis. Combining cross-case and within-case analysis "greatly reduces the inferential errors that can arise from using either method alone" (George & Bennett, 2005; 234). The identification of a causal link in more than one case generally makes the argument for that link more persuasive, it is another form of corroboration. It is important to remember that the corroboration is not declared using principals of statistical frequency. Additional cases may also indicate that a particular configuration of objects may not have a repeatable outcome. The interaction of the powers of objects involved may be so complex that they never occur in the same mix, sequence or strength. A general tendency rather than a specific outcome may be observed.

3.6: CASE DATA COLLECTED

A pilot case can help refine the research question and help establish the data collection needs and methods (Yin, 2009). Geographical proximity and convenient access can be reasons for case selection. A more prolonged and less structured process is likely as, perhaps, different data and data collection methods are experimented with. Data is collected from a variety of sources; documents, observation and interviews.

Two common processes in which customers are involved were examined, breakfast service and check-in. Check-in is (at present) an administrative necessity. It is an exchange of information and a formal transition of the person from an 'outsider' to a guest. Breakfast is, hopefully, a more pleasurable experience and one involving more resources and more variables. It includes tangible goods that must be consumed at the location. The check-out process is not examined explicitly because it overlaps with the breakfast process and would thus require the researcher to commit separate days to observe each process. Dinner service is not observed because hotels contain a great variety of dinner service concepts, a variety similar to that seen in the restaurant sector generally. There would therefore be little justification for choosing hotels as a focus of study.

Table 3.5 shows the main factors investigated in the pilot study. These represent the major factors that the researcher, prior to field research, believed affect service throughput in the restaurant.

Pre-service	
Facilities design and layout	Capacity (volume over time) Table size mix / flexibility Layout of service point (all round access versus against wall)
Service equipment	Generally the use of technology to aid and speed production or hold items Acceptable processing capacity (e.g. toaster speed) Range of / purpose per service point (e.g. hot & cold)
Materials	Calculation for volumes of product Policies for managing customisation and variability of demand
Staff	Evidence of training Deciding numbers required Task allocation
Activity	Actions to influence demand (e.g. pricing, advisory notices, room service, segregated restaurants)
Organisation	Service method (buffet or waiter) Standard Operating Procedures
In-service	
Facilities design & layout	Control access Re-set tables
Service equipment	Monitor condition and queuing
Materials	Monitor consumption and restock
Staff	Supervisory roles & actions Service staff roles & actions (specialisation versus multiple) Actions taken to speed throughput
Customers	Variability in arrival Accounting for variability in service time Accounting for variability in dwell time
Activity	Actions to mitigate actual and perceived waiting time
Observations	Evidence of waiting for service (entry, hot items, drinks, toaster, restocking)

Table 3.5: Main breakfast service factors to examine.

Table 3.6 shows the main factors that the researcher believed affected throughput time at check-in (out).

Pre-service	
Facilities design and layout	Capacity (volume over time) Layout of service point
Service equipment	In general the range and aims of technology Types / purpose per service point (e.g. express, self-check-out) Equipment speed
Materials	Calculation for volumes of customer
Staff	Deciding numbers required Task allocation Evidence of training
Activity	Actions to spread demand
Organisation	Standard Operating Procedures
In-service	
Facilities design & layout	Queue management
Service equipment	Number of steps and speed of operation
Materials	Ensure availability
Staff	Supervisory roles & actions Service staff roles & actions (specialisation versus multiple) Evidence of task speed Actions taken to speed throughput
Customers	Variability in arrival Accounting for variability in service time
Activity	Actions to mitigate perceived waiting time
Observations	Evidence of waiting for service

Table 3.6: Main check-in factors to examine.

3.6.1: Documents

Documents provide a record that does not depend upon the observations and recording ability of the researcher. Table 3.7 lists the strengths and weaknesses of documents as a source of evidence. The type of documents of interest here relate to those indicating performance objectives, procedures and policies of the work place.

Strengths	Weaknesses
• Stable – can be viewed repeatedly • Unobtrusive – not created as a result of the case study • Exact – contains exact names, references, and details of an event • Broad coverage – long span of time, many events, and many settings	• Retrievability – can be difficult to find • Biased selectivity, if collection is incomplete • Reporting bias – reflects (unknown) bias of author • Access – may be deliberately withheld

Table 3.7: Strengths and weaknesses of documentation. (Yin, 2009; 102).

The key documents were Standard Operating Procedures (SOPs). SOPs are expected to contain instructions and guidance for pre-service and in-service actions. Documentary evidence proved to be sparse.

3.6.2: Direct observation

Observational methods are underused in business and management research; there is too much reliance on verbal information and quantitative data (Gummesson, 2007).

Observational research captures action but not motive (Gummesson, 2007). Interviews can be used to uncover the reasoning behind the observed actions (Rundle-Thiele, 2009). Interviews and documents can present the official position of the organisation while observation can reveal the extent to which practice conforms to the official position (Graham, 1985). It is action that affects the outcome of a process so it is this that must be observed and mapped.

Observation of professionals at work is common. Medical and educational professionals, for example, are frequently observed to ensure that they are performing competently and providing an acceptable quality of service. The role of the observer varies over a continuum from covert (for example a mystery shopper) to participant (for example a doctor stepping in to correct the work of a junior).

Knowledge does not always take a written form, craft knowledge, or 'know-how' can be difficult to communicate in words and is often best communicated through demonstration (Polanyi, 1962; Sayer, 1992). Attempting to uncover knowledge purely through documents or questioning may not reveal craft knowledge. A person may even be unaware of that knowledge (Sayer, 1992), or may regard it as common sense and not knowledge. Craft knowledge can be observed.

There are two aspects to this observation. Firstly, the tangible objects that create the working space need to be surveyed to make note of their physical capacity and arrangement as these impact throughput time. Secondly, during service the actions of staff and customers that affect actual and perceived throughput time need to be noticed and noted.

Strengths	Weaknesses
• Reality – covers events in real time • Contextual – covers context of 'case'	• Time-consuming • Selectivity – broad coverage difficult without team of observers • Reflexivity – event may proceed differently because it is being observed • Cost – hours needed by human observers

Table 3.8: Strengths and weaknesses of direct observation. (Yin, 2009; 102).

In spite of the weaknesses of observation given by Yin (2009) in table 3.8, it is an essential requirement to attempt to observe the link between cause and effect and to corroborate the statements made in interviews and documents (Graham, 1985). Delays need to be observed and accounted for as do any actions taken to mitigate the situation. By focusing on only two processes and limiting the number of organisations studied this research is being selective. Service takes place over a time period and needs to be observed more than once in order to establish a consistent link between cause and effect and mitigate against the tendency for reflexivity. Three periods of observation of each process in action are made in each case and include the busy service periods when delays in throughput time are most likely occur.

Observation methods can be divided into structured and unstructured. Structured observation involves categorising actions and recording their frequency, or making other measurements (Martinko and Gardner, 1985). It is largely positivistic and relies on statistical inference to make conclusions. Unstructured observation required the researcher to enter the field with no pre-determined theories or categorisation, the approach is to record everything. The discussions so far clearly mark a highly structured or unstructured approach as inappropriate. Statistical inference does not uncover causation and individuals cannot observe untainted by theory. A key criticism of highly structured observation is that motivations for actions are complex and cannot easily be fitted to a narrow range of categories (Martinko and Gardner, 1985). Observation can be a mixed method with quantities observed where appropriate. Boote & Mathews (1999) conducted research that involved structured activities such as carrying out pedestrian traffic counts and assessing location against a limited list of features, later qualitative judgements were made as to the type of person eating in a restaurant.

Observation requires concentration on what is to be observed. In this case it is actions that affect the actual or perceived waiting time of customers before or during service. Typically these are actions that treat bottlenecks or shorten process duration for situations in which the customer is waiting for an action or outcome. The speed with which the action is completed and the effectiveness of the supervisory activities are both likely to impact throughput time.

Some actions that are likely to affect throughput time	
Pre-service action	Pre-service supervisory
• Setting tables • Preparing mise-en-place • Provisioning buffet	• Staff planning • Forecast guest numbers • Allocate responsibilities to staff and brief
In-service action	In-service supervisory
• Informing guests of the procedure • Resetting tables when vacated • Restocking buffet food and beverage items • Taking orders • Preparing items to order • Delivering ordered items	• Monitoring table occupancy • Monitoring buffet availability • Allocating demand to spare capacity • Managing any pre-service queue

Table 3.9: Pre-service and in-service activities likely to affect measured and perceived throughput time.

There is a difference between the action and what the action means to the actor, the same action can have different meanings in different circumstances (Sayer, 1992). Observations need to be supplemented by other research methods to help uncover the meaning of actions, asking employees why they did certain things could help uncover the meaning of the action (Sayer, 1992). Where appropriate during service, or in interviews, staff were asked to explain the reasons for action where the purpose was not clear or some of the communication between server and customer could not be heard.

3.6.2.1: Why time is being measured

The measurement of time could be considered an obvious requirement of research into process speed. The goal here is not to test a theory and ‘prove’ that changes in processes lead to a measureable reduction in process duration. The variability that the customer, as co-producer, introduces into the system would make such time claims meaningless. The goal is explanation of what, by its nature affects process duration. The question of by how much time the process could be reduced is irrelevant. The reduction of waiting time and some of the sources of variability will result in an improvement of throughput speed (Seddon, 2005). The nature of hotels as service will always mean that, especially in food service, there will be great variety in throughput time. Service duration is measured simply to build up a picture of the extent of variability. The measurement of the extent of variability is an essential consideration for arguments about how capacity can best be designed and managed to achieve appropriate throughput time.

3.6.3: Interviews

The primary source of data in case research is structured interviews (Voss et al, 2002). Table 3.10 shows the main strengths and weaknesses of interviews. Bias and reflexivity is addressed by interviewing a number of employees in different positions and identifying points of agreement and disagreement. The questions relate to activities and problems faced regularly in work so interviewee recall is not an issue. Key responses are written down so that the researcher does not have to rely on recall.

Formal standardized questions used in extensive research are useful for taxonomic comparisons but weak for researching causality (Sayer, 1992; p245). Less formal, less standardized questions allow the interviewee to provide responses that are particularly relevant to them, whereas preconceived questions can be adapted to suit the individual. Interviews should be guided conversations (Yin, 2009). A consistent line of enquiry is followed but in a conversational way. A friendly and non-threatening tone is recommended by Yin (2009). Questions should be phrased as ‘how’ instead of ‘why’, as Yin claims that ‘why’ questions can make some interviewees defensive. Sayer (1992 seems to support Yin’s approach by suggesting that “with a less formal, less standardised and more interactive kind of interview, the researcher has a much better chance of learning from the respondents what the different significances of circumstances are for them” (p245). Questions are used to seek explanations for the observed actions, to encourage reflection and the expression of the tacit knowledge of operational staff.

Strengths	Weaknesses
• Targeted – focuses directly on case study topics • Insightful – provides perceived causal inferences and observations	• Bias due to poorly articulated questions • Response bias • Inaccuracies due to poor recall • Reflexivity – interviewee gives what the interviewer wants to hear

Table 3.10: Strengths and weaknesses of interviews. (Yin, 2009; 102).

The responses expected from questioning were specific and short explanations that could quickly and easily be noted by hand. Understanding was verified by repeating back key responses to interviewees. The goal was to record their understanding of what affects throughput time. Three levels of staff were interviewed, service delivery, supervisors and departmental managers (where available). Service delivery staff were interviewed first because they are more likely to raise questions that needed to be answered at a higher level.

Some questions were asked of all levels, others were be specific to the higher levels depending upon the likely level at which decision responsibility lies.

3.7: CASE SELECTION

There is nothing to be gained by the search for and the selection of 'ideal types' for cases to study (Sayer, 1992). It is unlikely that the ideal represents actuality any more than an average represents and individual member of the population.

The hospitality industry has been practicing service for many generations and has well established and recorded working practices and a mobile workforce. There was a great similarity between organisations in the way that they achieved throughput time. There were also company specific or contextual reasons for differences in practice. Variations in practice suggest that there is more than one way of achieving the desired result or highlight reasons why one organisation achieves a more appropriate throughput time than another.

3.8: PROCESS SELECTION

The desire was to investigate processes in which customers interacted with employees so that customer and operator variability could be observed. All guests check-in and check-out and many have breakfast. Available time for research was limited so a choice needed to be made between observing check-out or breakfast as they occur at the same time. To enable the researcher to contrast processes and to see if there were different types of and responses to variability it was decided to focus on check-in and breakfast.

It was expected that frequent queuing would be observed at the front desk but there were no expectations with regard to the extensiveness of process duration or request variability. It was expected that breakfast service would experience

3.9: THE HOTELS

All the four star hotels investigated were located in the centre of Birmingham. Brief descriptions of the hotels and the processes are given below.

3.9.1: Hotel A

The first hotel visited had over 300 rooms. Observations took place in July 2011, check-in was observed on a Tuesday, Wednesday and Thursday. Breakfast was observed on a Wednesday, Thursday and Sunday.

3.9.1.1: Hotel A Breakfast

In the morning guests would arrive at the ground floor in the lifts, to the right is the front desk, to the left they see the restaurant, beyond the bar island. The ground floor had no internal walls. Running down the centre of the restaurant were a set of circular seating booths, this split the restaurant into two parts. The natural line of sight from the lifts drew guests to enter where the greeting desk was located. Just past the restaurant entrance on the left was the first breakfast service counter, the hot buffet. The next buffet was a cold counter containing fruit, dairy and cold meats. Beyond that the final counter was for breads, toast and cereals. Entrance and exit doors to the kitchen were located between buffet sections. The restaurant had 136 covers laid on 55 tables (43x2, 11x4, 1x6).

The observer occupied a table from which the buffet and restaurant entrance could be observed. The high backed fixed seating running down the centre of the restaurant meant that only one half of the room could be observed.

3.9.1.2: Hotel A Front Desk

The hotel had a Concierge desk and a reception counter with five check-in desks. On most occasions three or four staff were on duty. A large unfurnished area at the front desk merged with seating which then became the bar, this adjoined the restaurant. The concierge desk was just inside the front door and the front desk was adjoining it just a few paces inside and at a right-angle to the main entrance. The lifts were located just beyond the front desk. There was an office behind the front desk, activity in the foyer could be observed on a TV monitor.

Two observation sessions were made from a seat approximately five meters from the reception, the third observation was made from behind the reception desk. The observer wore a suit and tie throughout the observations and a badge stating that he was an observer.

On July 5th observations took place from 3:50pm – 7:50pm. This was the first observation period and was a little experimental. On July 6th observations took place from the lobby between 4:00pm and 8:00pm. The aim was to record queuing and service times for check-ins. On July 7th the observer was stationed behind reception to observe:

- The variety of tasks undertaken by staff.
- The variability in the check-in process due to labour or capital.
- The variability in the check-in process due to customers.

Staff were observed for three hours from 4:00pm, occasional questions were asked to clarify the tasks that they were engaged in.

3.9.2: Hotel B

Hotel B was a modern hotel with 211 bedrooms, observations took place in September 2011, check-in was observed on a Tuesday, Wednesday and Thursday, breakfast on Wednesday, Thursday and Sunday.

3.9.2.1: Hotel B: Breakfast

The restaurant had a narrow entrance at which guests were greeted and seated, a line of fixed double sided seating ran down the centre of the room, it was punctuated twice to allow access. Breakfast was served in the restaurant from 6.30am to 10.30am Monday to Friday, times change slightly at weekends. The restaurant narrowed at the far end due to the shape of the building, it was here that the buffet stations were located. There were three stations, the first was for breads and cereals. Adjoining that was the hot buffet, there was space for a chef to work behind the counter but, to save money, the station was unmanned. Beyond this and behind a low wall was the cold buffet with juices, meats and dairy products. The restaurant had 33 tables laid with 88 covers (1x1, 22x2, 9x4, 1x7).

There were three observation sessions, the Wednesday observation started at 6.00am and finished at 9.30am. Service was observed form 6.30am to 9.30am on Thursday and from 7.30am to 11.00am on Sunday. The observer occupied a table near the buffet and recorded arrival and departure times of a number of observable tables, 120 observations were recorded over the three observation sessions. General observations were made about behaviour observed that may affect speed of service.

3.9.2.2: Hotel B: Front Desk

The ground floor was compact, on entering through the rotating door there were four separate reception desks to the right, beyond the desks was a very short corridor leading the lifts and an access to the car park. Opposite the desks was the bar lounge and a staircase leading to the first floor Restaurant. The lobby area left little room for queuing. One of the four desks appeared to have been a concierge desk but was used to display brochures and free newspapers, it was unmanned (the computer didn't work).

Each of the three front desks had a telephone, computer screen, keyboard, printer and key card programmer. A selection of key wallets and key cards was stored under the desk. A few feet behind the desk, built into a wall, were some discrete drawers and cupboards containing forms, toiletries and other items that guests may frequently request. Behind the wall there was an office containing computers, telephones and a key card programming computer. A patterned and frosted glass panel built into the wall allowed any employee sitting and working in the office to observe the lobby and front desks. On most occasions three, sometimes four, desk staff and a supervisor were present either in the back office or on the front desks.

Some left luggage was stored (to the side) behind the front desks, other luggage was deposited in a store room behind the staircase. On most occasions three, sometimes four, desk staff and a supervisor were present either in the back office or on the front desks.

On the Tuesday the observation period ran from 15:50 to 19:50, on Wednesday from 16:00 to 19:40 and on Thursday from 15:45 to 19:36. On Tuesday and Thursday data was collected about the duration of check-ins and sources of, mainly, customer variability. On Tuesday and Thursday the observer sat on a stool behind the concierge desk. On Wednesday the stool was placed close to one desk so that the actions and conversations at (mainly) that desk could be heard and observed (see table below). On all days occasional questions were asked of desk clerks to clarify why some check-ins seemed to be taking a long time. 100 observations of check-in duration were recorded.

3.9.3: Hotel C

Hotel C was more of a boutique operation with 66 rooms, it had been converted from a late nineteenth century hospital. The hotel also had a popular bistro and encouraged reservations for dinner and breakfast from non-residents. Observations took place in November 2011, check-in was observed on a Tuesday, Wednesday and Thursday, breakfast on a Wednesday, Thursday and Friday. No additional useful observations had been recorded on the two Sunday observations, so the third observation was changed to a more convenient day.

3.9.3.1: Hotel C: Breakfast

The cold buffet was located just inside the restaurant, orders were taken for hot food. There were 20 paces and five steps between the kitchen and dining room. Two waiting staff were assigned to bring cooked items from the kitchen and to clear tables while at least one member of staff monitored arrivals and took orders. The restaurant was divided into two parts. It had 61 covers on 22 tables (15x2, 2x3, 4x4, 1x9). Only the two top tables were square and could thus easily be joined to make bigger tables.

There were three observation sessions, the Wednesday observation started at 6.00am and finished at 9.34am. Service was observed form 6.57am to 9.31am on Thursday and from 6.54am to 9.52am on Friday. There seemed to be a few later arrivals for Friday breakfast so observation was extended until the guests departed. The observer occupied a table near the buffet and recorded various timings. General observations were made about behaviour observed that may affect speed of service.

The observer was able to record the arrival time of all guests entering the restaurant and the departure time of the 11 tables in the most occupied section of the bistro. He also attempted to note, as many times as possible, the time that hot food was ordered and then delivered to each table. Observations were made of the arrival times of 105 tables, the duration of breakfast on 78 tables and the order and delivery time of 46 tables.

3.9.3.2: Hotel C: Front Desk

The reception desk consisted of two stations. Bedrooms were given names and not numbers, traditional keys were used, not key cards. There was no written check-in procedure. The front of house manager was on duty for all three observations, she had worked in the hotel for six and a half years, mostly on the front desk.

The front desk could be manned by up to two members of staff and was tucked under the stairs a few yards inside the entrance. One porter had been cross-trained to check guests in and out. Porters were always close by as the hotel offered a valet parking service. The bistro style restaurant was just inside the entrance and next to the front desk. The observer was seated only one metre from the desk so conversations could be heard and questions easily asked.

Three periods of observation were carried out. On Tuesday November 15th reception was observed from 4.00pm to 7.44pm, on Wednesday November 16th from 4.00pm to 7.33pm, and on Thursday from 4.00pm to 7.30pm. 60 check-ins were observed, in all 647 minutes were spent observing only 120 of which, or 18.5% of the time, were consumed by check-ins.

3.9.4: Hotel D

Hotel D had over 110 rooms and was opened as a hotel in the late nineteenth century, it was very close to the main railway station. Apart from the foyer and lounge, the ground floor was occupied by retail units. The restaurant was on the first floor. Observations took place in March 2012, check-in was observed on Tuesday, Wednesday and Thursday, breakfast on Tuesday, Wednesday and Friday. The manager did not want breakfast observations on the Thursday as senior management of the company had been staying over.

3.9.4.1: Hotel D: Breakfast

The restaurant was located on the first floor and overlooked the main pedestrianised street in the city centre. The room was plain with a high ceiling and wooden floor, this plainness delivered an initial impression of a cafeteria rather than a hotel restaurant. There were 25 tables with 67 covers (17x2, 7x4, 1x5). A few additional bar tables had been laid for breakfast in case the restaurant was full but this area could not be observed.

There were three observation sessions, the Tuesday observation started at 6.00am and finished at 9.41am. Service was observed from 6.45am to 9.30am on Wednesday and from 6.54am to 9.33am on Friday. The observer occupied a table in the corner of the restaurant and recorded various timings. General observations were made about behaviour observed that may affect speed of service.

The observer was able to record the arrival and departure time of many, but not all, guests entering the restaurant. He also attempted to note, as many times as possible, the time that hot food was ordered and then delivered to each table. Over the three days observations were made of the arrival and dwell duration times of 113 tables, and the hot food order and delivery time of 61 tables. Some guests ordered hot food as they were being seated, the rest of the time servers returned to the table after a few minutes to take the food order.

3.9.4.2: Hotel D: Front Desk

Two periods of observation were undertaken from a chair in the lobby and one from behind the front desk. The time of arrival to check-in and the duration of check-in were recorded. Notes were made of other observed reasons for guests to approach the desk. There were two staff on duty, occasionally the general manager helped with check-in. The front desk was observed from 15:50 to 19:10 on Tuesday, 15:40 to 19:30 on Wednesday and from 15:50 to 19:30 on Thursday.

A total of 68 check-ins were observed and timed. Apart from two check-ins all arrival times and durations of check-ins were recorded.

3.10: METHOD IN THE FIELD

Each service in each hotel was observed for approximately three hours on three occasions. In total 38 hours were spent observing breakfast and 44 hours observing the front desk; 284 check-in durations and 355 breakfast durations were recorded. A total of 19 staff were given short interviews (see Appendix 1). To help triangulate the observations and interviews, the researcher is also able to draw on 25 years of experience living and working in hotels, lecturing on the subject, and personal experience of staying in hotels.

Contact with the hotel manager was made by email at least four weeks before the planned date for research. The email outlined the aims of the research and the data that would be collected (see Appendix 2). Four out of five hotels contacted agreed to take part. A meeting was arranged with the manager and details discussed. A briefing sheet (See Appendix 3) was provided which managers could use to brief staff if they so wished. On some occasions the researcher was introduced to departmental heads or supervisors. A reminder was sent to managers about a week before fieldwork commenced. On all occasions supervisory staff had been briefed and were expecting the researcher.

After data had been gathered a report was prepared for each hotel providing findings and brief analysis of quantitative and qualitative data (see Appendix 4). Managers were invited to check the contents for factual errors and to send comments. No feedback was received.

Hotel A was originally intended as a pilot study, but the data gathered proved worthy for inclusion in the study. The first day in each department in this hotel was rather experimental and most of that data was discarded.

3.10.1: Breakfast Service Observations

To observe breakfast service the researcher chose and occupied a table from which the entrance, buffet and a number of tables could be observed. It was not possible for a lone observer to keep track of arrivals and durations of all tables. The aim was to get a picture of the variability in arrival patterns and dwell times; the aim of the thesis does not require a complete record of guest arrival and service durations. Dwell time was recorded from when the guest(s) sat down at a table until the guest(s) rose to leave. Each table was given a code to help the researcher remember which timing referred to which table. Guests who arrived together were treated as one record unless they departed at different times. If a second or additional guest joined they were given the same table code and, if necessary, a short descriptor to enable the researcher to remember which guest arrived at which time. Only in the smallest of the hotels was it possible for one researcher to record at least the arrival time of all guests, even here some were seated out of sight and could not be monitored further (see Appendix 5 for an example).

Accurate recording of timings was only one purpose of the fieldwork. It was also important to observe behaviour of guests to account for varying dwell time. Activity consumes time and it is mainly the activities of guests at the table that impact and determine the dwell duration, just as their choice of when to take breakfast impacts the arrival time. One aim was also to observe staff, to attempt to note whether any of their actions affected guest dwell time.

The first observation in each hotel started before the restaurant opened for breakfast service. This was conducted in order to record any pre-service actions in the restaurant that may speed service and to note any variation in the starting times of staff. Observations were limited to front room operations, i.e. what guests could see; kitchen preparations and service were not observed. Questions were, however, asked about kitchen practices that affect the availability of food and the speed of service. Observation was terminated when the number of arrivals dwindled, generally around 9.30am for all hotels.

3.10.2: Front Desk Observations

The aim here was to record check-in service durations and to note any causes for variation in arrival time and service duration. Once observation started it quickly became clear that task variety was a key feature of the front desk clerk's job (see Appendix 6 for an example of a data collection sheet).

In hotels A, B and D two sessions were spent observing from a chair in the foyer and one session was spent behind the reception desk. In hotel C the researcher was behind the desk with staff the whole time. In hotels A and B the session behind the desk involved shadowing one employee. In hotels C and D only two clerks were working, so it was possible to observe and interact with both throughout the session spent behind the desk. The observer wore a badge with the UCB college logo and the word "observer" printed on it so that arriving guest would know he was not a member of staff.

Where the researcher could not hear or see the cause of a time delay a note was made and a question asked when the clerk was not occupied with a guest. Where the researcher could not see or understand the task the clerk was engaged in, he asked. The list of causes of process variability and the variety of tasks undertaken by clerks is limited to those observed. It is certain that other tasks and causes do crop up that were not observed. However, the aim was not to uncover an exhaustive list, but to demonstrate the existence of events and reasons that can account for, or cause, the variability and to consider both their effect and how they might be dealt with.

3.10.3: Field Research Summary

Yin (2009) acted as the main source of guidance in planning and implementing field research. The application of case study field methods has been briefly discussed. The following chapter will set out and discuss the main findings.

3.11: CHAPTER SUMMARY

This chapter started with a discussion of knowledge and causality and sought, briefly to argue a certain view that seems to 'make sense' to someone with some years experience as a hotel and business manager. The chapter then moved on to more practical matters by justifying the case study approach as a tool for revealing useful knowledge. It concluded with a brief description of the implementation of the research methods.

An aim of this thesis is to arrive at some practically adequate knowledge that managers can apply to their operations. Future chapters try to make sense of the perceptions (Polanyi, 1962) noted to develop insight and ever more sophisticated explanations (Tsoukas & Valdimirou, 2010) of the causes of throughput time. Causes at the operational level of business can be discerned by the use of transitive verbs, reasons can also be causes of events. Processes are causal mechanisms and evidence of causal relationships is sought through direct observation (Stuart et al, 2002). Retroduction rather than induction is used to work back from the event to the mechanisms capable of producing the event.

Managers try to understand the nature of objects and arrange them so that the outcomes of their interaction lead to the desired event and outcome. Humans have a socially real world that attaches meanings to physical objects and social encounters. Humans have the tendency to act in certain ways (Archer in Lawson, 2007) rather than the certainty that can be observed in physical objects. Service is created in response to human demand and the reasons for actions can be said to be the cause. Human action that explains throughput time can therefore said to be a cause.

The following chapters present the findings of the field research and offer an interpretation as to the causes of throughput time. These causes can be found in the necessary behaviour of physical objects (including humans as physical objects) and in the actions observed and the reasons proposed.

CHAPTER 4: FINDINGS

4.1: INTRODUCTION

The aim of the thesis is to explore what theory says about how resources and processes can be configured to achieve appropriate throughput time or to quickly adapt to cope with short-term increases in demand and to investigate the actual tactics used in hotels. This chapter will present evidence for the extent of variability in arrival and processing times and observations of reasons for variability. This chapter will, firstly, present quantitative findings illustrating the observed extent of arrival and duration variability and discuss the implications of this for maintaining appropriate throughput time. Observed causes of variability will be grouped as customer or system variability and the impact of variability on throughput time analysed. The extent to which observed properties of resources and processes resulted in appropriate throughput time are discussed.

The basic causal links and line of argument is illustrated in figure 2.9. Variability in arrival times and process duration result in variable demand for capacity. If appropriate throughput time is to be maintained capacity needs to be adjusted in anticipation of, or in response to, varying demand. Physical demand is accommodated by flexing physical capacity. The capacity to process customers is improved by reducing the number and duration of tasks and encounters required of employees. The amount of time that customers occupy physical capacity (labour and capital) is reduced or capacity in the form of capital (facilities and equipment) is provided to accommodate customers and allow them to carry out some of the tasks themselves. This line of argument is supported with data from primary and secondary research. The particular customer-focused context requires that generalised solutions need to be modified.

4.2: QUANTITATIVE FINDINGS OF ARRIVAL AND DURATION: BREAKFAST

This section presents and analyses the quantitative data collected for breakfast service. Across the four hotels 355 observations were recorded for breakfast dwell duration including 107 for hot food order to delivery time. It needs to be remembered that quantitative data was collected to get an impression of the extent of time variability, the primary source of relevant data is qualitative. Resources were not available to record every arrival, duration and departure. It is likely that a greater proportion of early and late arriving guests had timings recorded; at peak time it was simply not possible for a one researcher to record everything. Given that the data is therefore incomplete more detailed analysis would not provide any valid or useful additional information.

The arrival times of all breakfast guests were recorded only in hotel C, which was small enough to note every arrival (see table 4.1). Observations of table occupancy support the finding that, on most occasions, there are a few early arrivals for breakfast; that arrival frequency increases towards the middle of breakfast service and, at least on weekdays, tends to start to decline at around 8.30am.

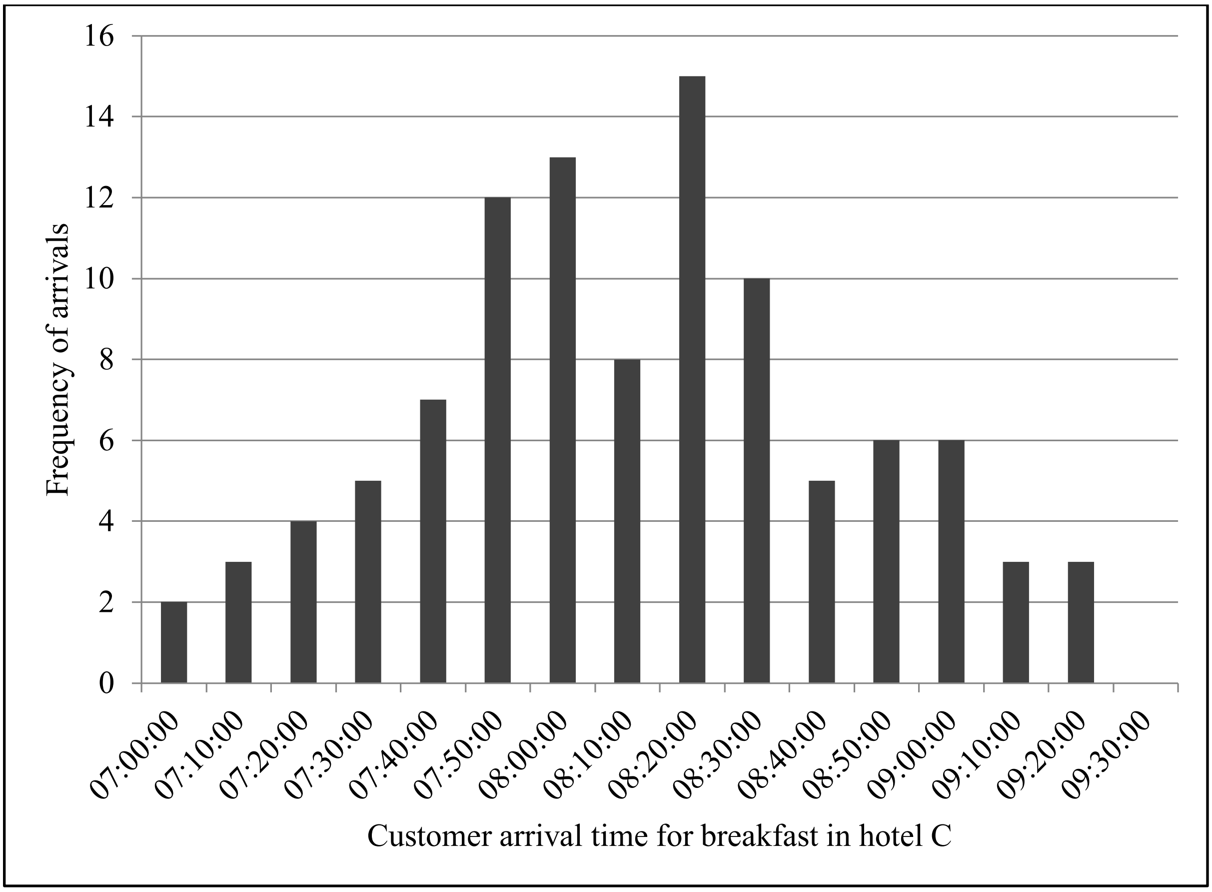

Figure 4.1: Frequency chart for breakfast arrival times in hotel C.

The impact of arrival times on the capacity to serve can be illustrated by the following three examples. On the first day in hotel D 94 guests were expected for breakfast; on the second day 116 were expected. At one time on the first day the restaurant was nearly full and the researcher was expecting to be asked to vacate the table. On the second day more guests were expected but the restaurant was never more than two-thirds full.

The following observation was made during Sunday breakfast service in hotel A. At 8.25am the restaurant was judged to be approximately half full, falling to about one-third full at 8.50am. Shortly after 9.15am the arrival rate picked up. By 9.30am the rate at which staff could reset tables was starting to limit the table choice of arriving customers. By 9.40am customers were occupying tables that had been cleared but not reset. A few customers were starting to leave their seats to find staff and make requests. At 9.40am the researcher could see only one or two empty (but not reset) tables and a number of guests arriving, so he left the table to observe from outside the restaurant. From approximately 9.40am until 10.20am the staff struggled to cope with a full restaurant. Customer queues for entry were minimal with waits of one or two minutes.

The following observation was made in hotel B. No queuing was observed and the restaurant was never more than three-quarters full. On weekdays the numbers in the restaurant started to increase shortly after 7.00am and began to decline around 8.15am. On Sunday 70 guests staying as a group ate breakfast at 7.00am. When the observer arrived at 7.30am there were 18 guests in the restaurant. From 9.15am to 11.00am there were between 20 and 30 guests in the restaurant at any one time.

These three examples clearly illustrate that, while there may be a period during which arrivals peak, this and the spread of arrivals can vary from day to day. The total number of customers expected is neither a good indication of whether there will be a time when all tables are occupied nor of the number of staff required to cope with demand at any particular time during service. Breakfast staff in hotels A and C commented that there were occasions when many customers arrive at the same time. The researcher's personal experience of managing and staying in hotels is that on Sundays, for example, guests like to lie in and eat breakfast towards the end of the service period, frequently leading to queues for tables. Hotels A and B were observed on Sundays and this pattern was not observed. This is another indication that there are no set patterns of arrival, only tendencies.

Dwell duration is also variable. While figure 4.1 records arrival times it does not show dwell duration or departure times. Arrival time is not a reliable indicator of how many tables will be occupied in, say, 25 minutes time because dwell duration is also highly variable. A final observation is that it is not possible to predict the number of seats that will be occupied on each table, which is discussed in greater detail in a later section. People, unlike material objects, have a sense of personal space and are usually reluctant to share a table with someone that they do not know. There can be occasions where there are many empty seats in a restaurant but no spare tables.

Table 4.1 shows the key observed breakfast duration statistics.

	A	B	C	D	**All**
Mean	00:22:57	00:26:26	00:30:01	00:26:33	00:26:44
Median	00:23:00	00:24:10	00:26:23	00:24:30	00:24:30
Standard Deviation	00:09:47	00:12:12	00:13:15	00:10:58	00:11:52
coefficient of variation	42.63%	46.11%	44.13%	41.29%	44.40%
Minimum	00:08:00	00:06:47	00:06:10	00:07:00	00:06:10
Maximum	00:47:00	01:03:15	01:04:25	01:04:00	01:04:25
Range	00:39:00	00:56:28	00:58:15	00:57:00	00:58:15

Table 4.1: Key observed breakfast duration statistics.

The difference between the mean and the median indicates a skew in the data. The median figure is a better representation of the duration of the 'typical' customer as it is around this point that most observations are recorded. The standard deviation is an indication of the average deviation from the mean. The coefficient of variation is an expression of the standard deviation as a proportion of the mean. A proportional figure communicates the extent of variation more clearly. Figure 4.2 displays the breakfast durations as a scatter chart and is overlaid with lines showing the mean and one standard deviation either side of the mean. In a normal distribution around 67% of observations would be expected to fall within one standard deviation of the mean, here 73% of observations do. As a rough guide managers could assume that around three quarters of guests will spend between 15 and 40 minutes eating breakfast. Perhaps more usefully observations revealed that half of all guest occupied tables for less than 25 minutes and 90% of guests left within 45 minutes (see table 4.2).

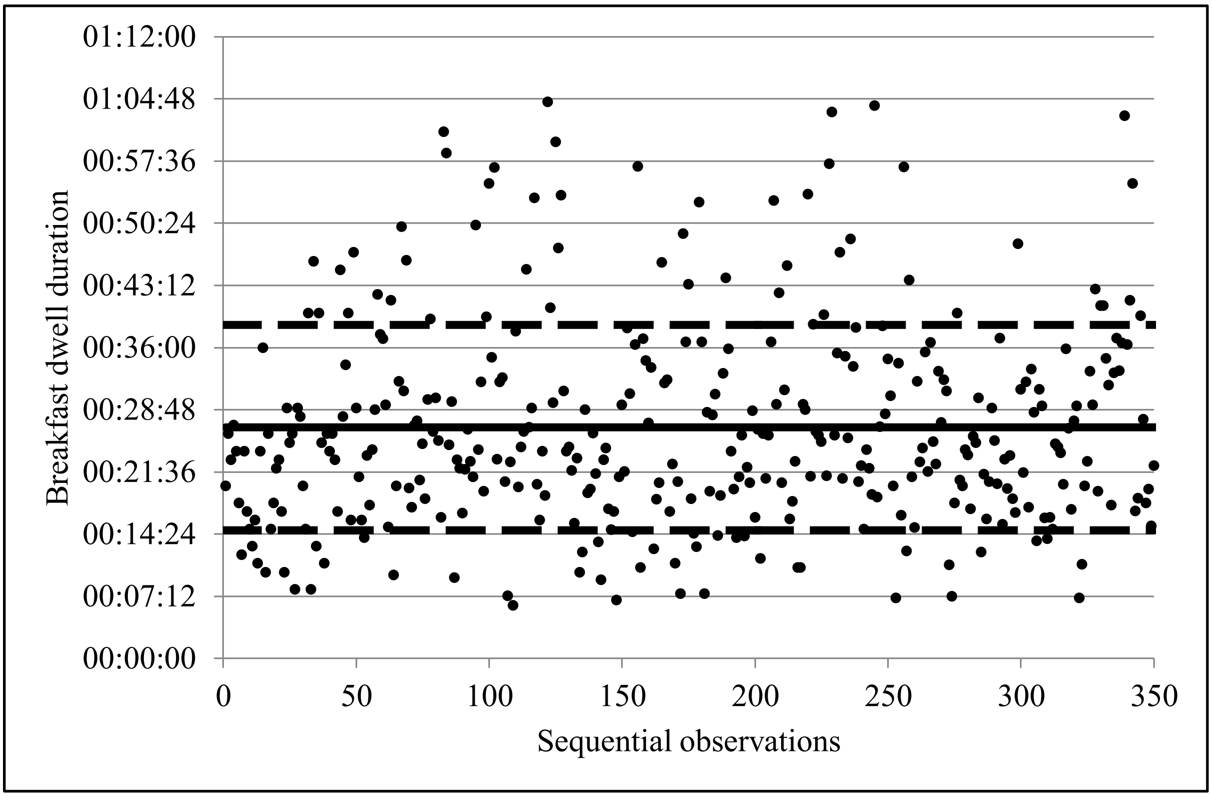

Figure 4.2: Scatter chart of breakfast durations overlaid with lines showing the mean and one standard deviation.

Up to X minutes	Cumulative %
00:05:00	0%
00:10:00	4%
00:15:00	14%
00:20:00	30%
00:25:00	52%
00:30:00	68%
00:35:00	79%
00:40:00	86%
00:45:00	91%
00:50:00	94%
00:55:00	97%
01:00:00	99%
01:05:00	100%
01:10:00	100%

Table 4.2: Table showing the cumulative distribution of breakfast duration as a percentage.

Figure 4.3 groups the dwell duration to illustrate more clearly the differing amounts of time spent at breakfast. The 25 minute column represents the approximate mean and median dwell times. Clearly there is a great deal of variation in the amount of time spent at breakfast.

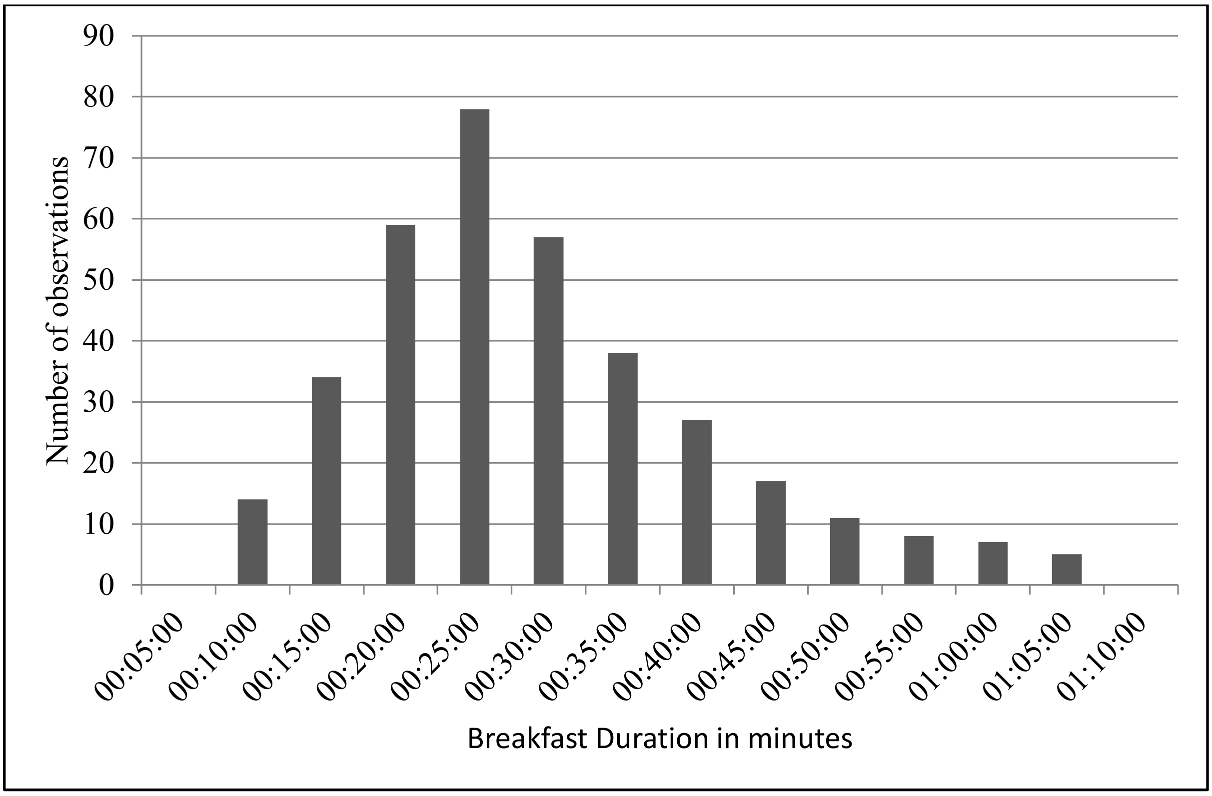

Figure 4.3: Frequency chart of observed breakfast dwell times.

For hotels C and D, where hot food had to be ordered, it is possible to separate out data for tables that ordered hotel food (107 observations) from tables that did not (84 observations), see table 4.3. Observations indicate that mean and median duration for tables not ordering hot food was six minutes less than for tables that did. The provision of a very good range of hot and cold items is a requirement of four star AA hotel classification (AA, 2006). It is not possible to predict what food any individual customer will choose to eat, the number of people likely to order hot food and when is therefore unpredictable.

	Food Ordered Duration (108)	Food Not Ordered Duration (85)
Mean	00:30:53	00:24:16
Median	00:28:30	00:22:37
Standard Deviation	00:11:48	00:11:21
coefficient of variation	38.23%	46.79%
Minimum	00:15:10	00:06:10
Maximum	01:04:25	01:02:50
Range	00:49:15	00:56:40

Table 4.3: Statistics for durations of tables that gave hot food orders and those that did not from hotels C and D.

In summary, while there may be tendencies for breakfast arrivals to fit a general pattern the actual arrival time and inter-arrival time of guests is unpredictable. The dwell time of customers varies depending on many unpredictable factors. While average dwell time and the frequency distribution can be established, the arrival and dwell time of any one customer cannot be predicted. Table occupancy is also unpredictable as it depends on party size. This last point is discussed in more detail later.

4.3: QUANTITATIVE FINDINGS OF ARRIVAL AND DURATION: FRONT DESK

This section presents and analyses the quantitative check-in duration data collected. Across the four hotels 284 observations were recorded for arrival time and check-in duration. As with time data collection for breakfast, the primary reason for quantitative data collection was to gain an impression of the extent of time variability, whilst every effort was made to record the arrival time and duration of every check-in some may have been missed. Table 4.4 shows the key observed check-in duration statistics.

	A	B	C	D	**All**
Mean	00:02:48	00:03:50	00:02:01	00:03:08	00:03:05
Median	00:02:20	00:03:20	00:01:52	00:02:40	00:02:35
Standard Deviation	00:01:45	00:02:34	00:01:15	00:02:45	00:02:20
coefficient of variation	62.65%	66.65%	62.38%	87.31%	75.86%
Minimum	00:00:07	00:00:10	00:00:15	00:00:15	00:00:07
Maximum	00:08:40	00:12:20	00:07:00	00:18:50	00:18:50
Range	00:08:33	00:12:10	00:06:45	00:18:35	00:18:43

Table 4.4: Key observed check-in duration statistics.

The table shows differences between the statistics for each hotel. Hotel C appears to have the shortest check-in duration and hotel B the longest, almost twice as long as hotel C, all hotels used the same software programme. Reasons for these differences will be examined in a later section. As a very approximate calculation, only around 20% of available front desk clerk hours were spent checking people in during the observation sessions. These took place mainly between 4.00pm and 7.00pm, the period when the majority of guests are expected to check-in (Vallen & Vallen, 2009). Check-in duration becomes an issue if there is a queue of people waiting for service. While queues were observed, they were so rare or brief that the data on queue times has not been included. Another reason for the exclusion of this data is that when queues did form it was usually because a group known to each other arrived at the same time.

Figure 4.4 shows the frequency distribution for check-in duration, the average is pulled away from the mean by the less numerous occasions when check-in duration far exceeded the median. This is clearer on figure 4.5 which shows the data as a scatter graph. Table 4.5 shows the cumulative frequency of check-in duration as a percentage, over 75% of check-ins were completed in less than three and a half minutes and 90% of check-ins in less than five minutes, or approximately one standard deviation above the mean. In general check-in is a process with a brief duration.

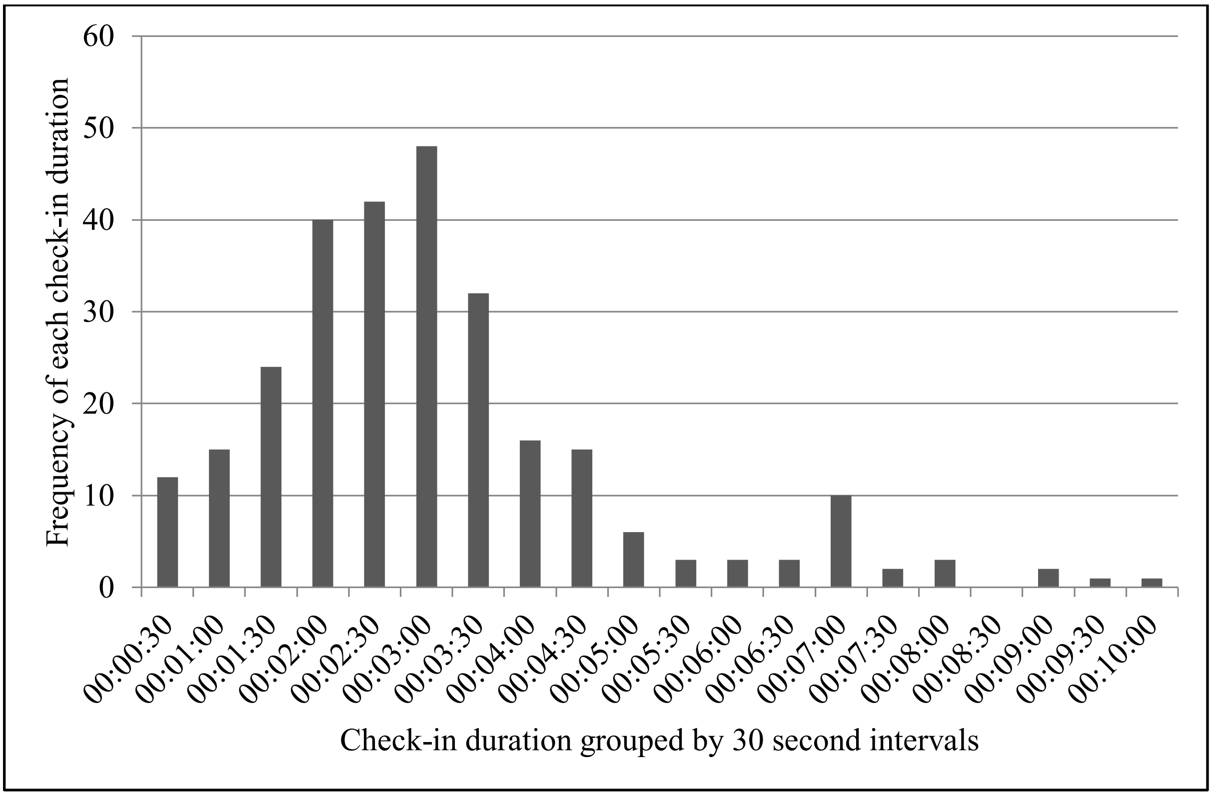

Figure 4.4: Observed check-in duration frequency.

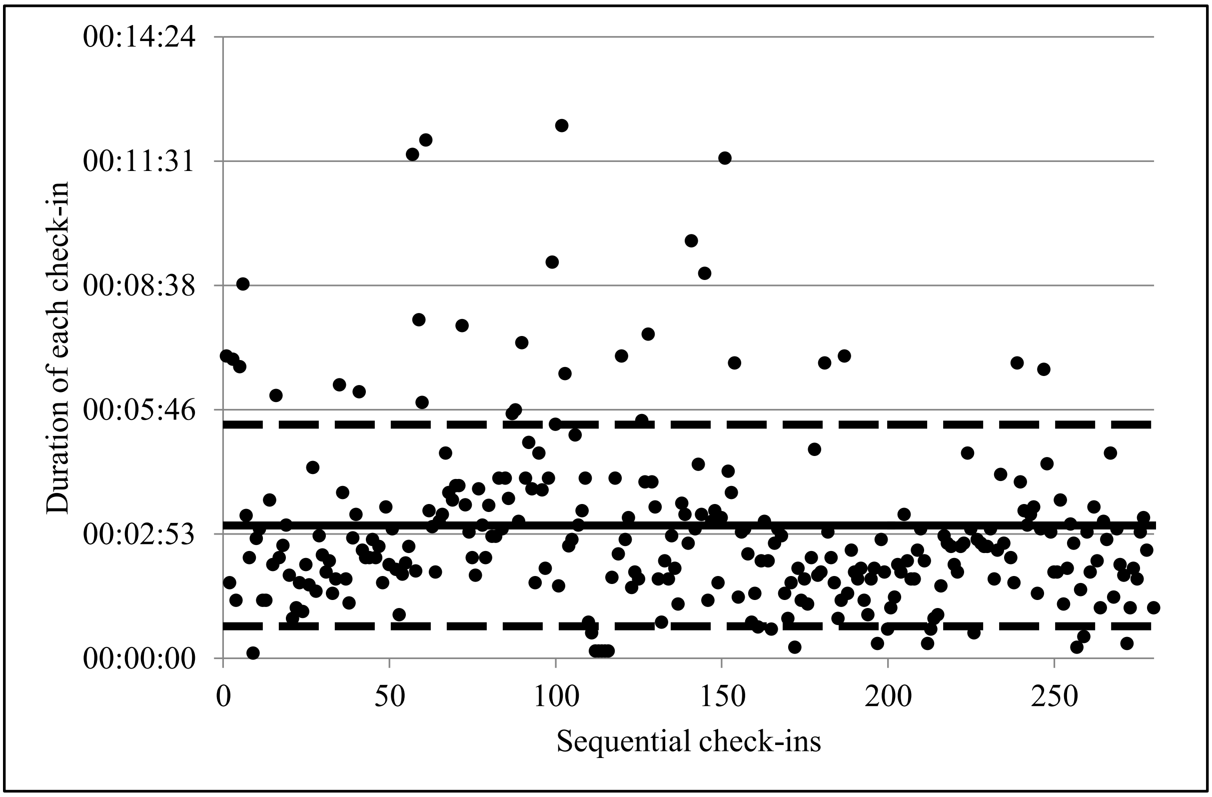

Figure 4.5: Scatter chart of check-in durations overlaid with lines displaying the mean and one standard deviation.

Service Duration half minutes	Cumulative %
00:00:30	4%
00:01:00	10%
00:01:30	18%
00:02:00	33%
00:02:30	48%
00:03:00	65%
00:03:30	77%
00:04:00	82%
00:04:30	88%
00:05:00	90%
00:05:30	91%
00:06:00	92%
00:06:30	93%
00:07:00	97%
00:07:30	97%
00:08:00	99%
00:08:30	99%
00:09:00	99%
00:09:30	100%
00:10:00	100%

Table 4.5: Table showing the cumulative frequency of check-in times as percentages.

Where no queue time was recorded it was assumed that the arrival time at the front desk was the same as the start of the service process. The inter-arrival time of guests at the front desk was lumpy. Figure 4.6 shows the frequency of arrivals to check-in by 15 minute time intervals and indicates that guests tend to arrive for check-in between 4.30pm and 7.00pm.

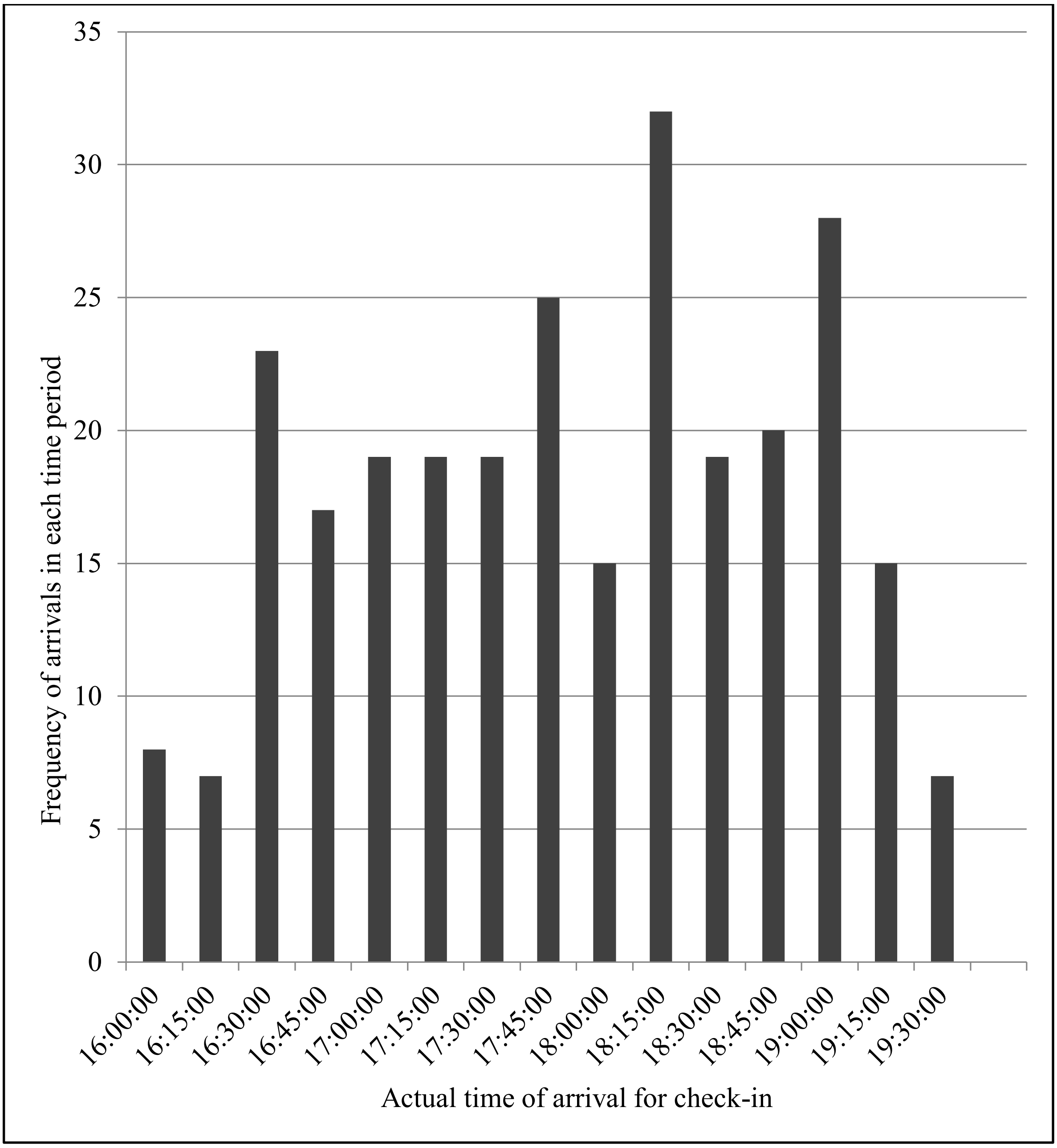

Figure 4.6: Check-in arrival time frequency.

The observed inter-arrival pattern reveals lots of short inter-arrival times and fewer long inter-arrival times (see figure 4.7). This pattern is similar to that expected in systems where arrivals are random. Thus, while the likely time period for many arrivals and number of guests due to check in may be known the arrival time of any one guest cannot be predicted.

There were times when several guests were checking in and times when one or no guests were checking-in. This pattern can partly be explained by the observation that small groups known to each other tended to arrive at the same time; they had either travelled together or were attending an event in the hotel that had just finished.

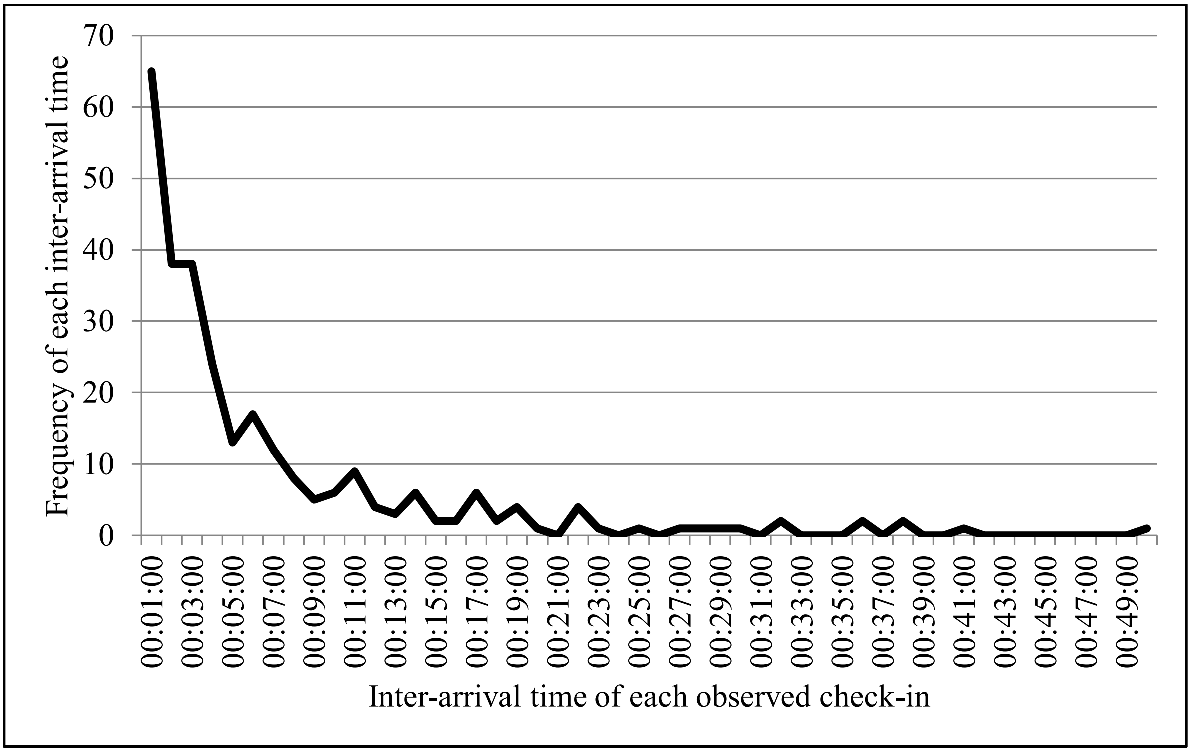

Figure 4.7: Inter-arrival times for check-in.

Figure 4.8 shows an illustrative throughput delay curve. The vertical axis represents times, the horizontal axis capacity utilisation. The solid black curve is calculated using the coefficients of variation for the observed inter-arrival and check-in duration times assuming three servers. Each curve represents a 20% and 40% increase or decrease in both coefficients of variability. If a maximum desirable check-in duration average of 4 minutes is assumed, and it is further assumed that guests only come to the desk to check-in, then the intersection of each curve with the 4 minute line represents the maximum level of capacity utilisation that is required to achieve the target. As either source of variability is reduced the level of capacity utilisation that the system can achieve while achieving the target increases. An increase in the number of servers is an increase in capacity and will also result in a flattening of the curve. This chart illustrates that spare or flexible capacity (often in the form of labour) is required to absorb variability and maintain an acceptable throughput time.

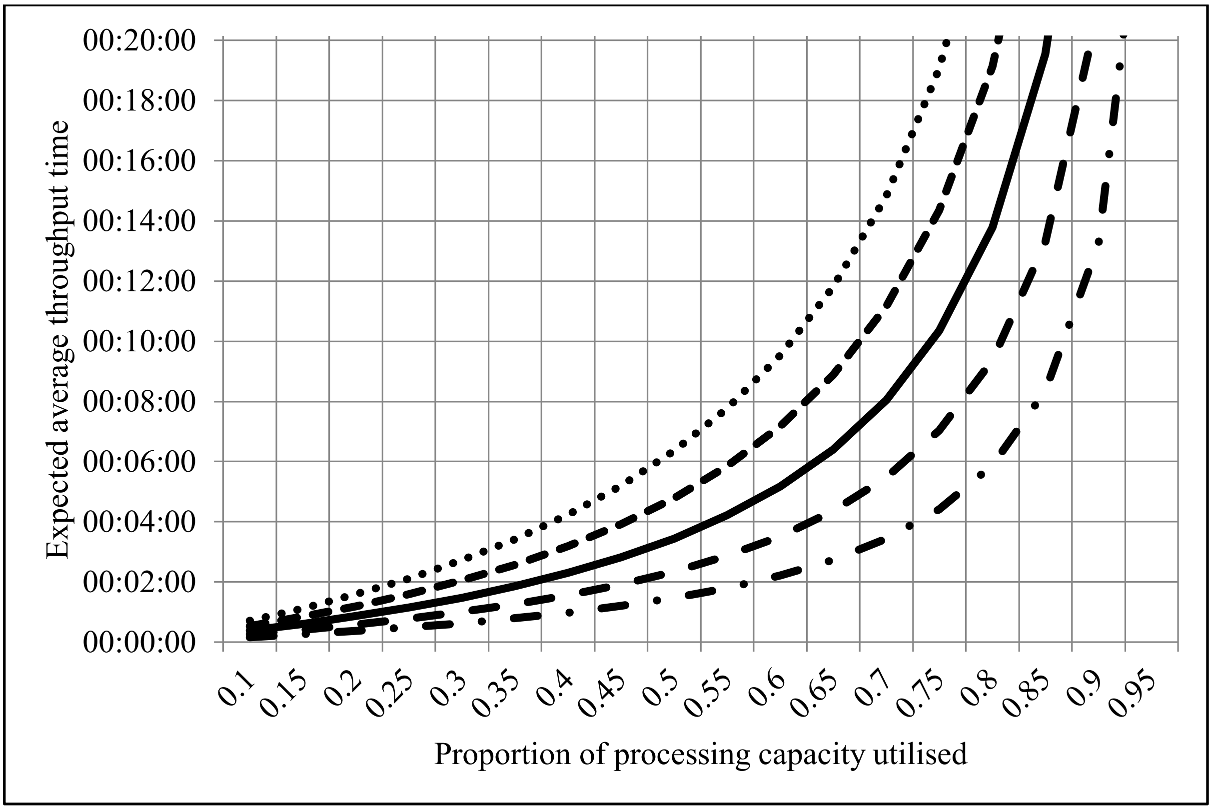

Figure 4.8: Illustrative Throughput Delay Curve.

Front desk clerks were required to respond to a wide range of queries and requests from hotel guests and visitors. When queuing was observed it was sometimes because one of the front desk clerks was responding to a query or request from a guest already checked-in. The subject, arrival time and duration of queries and requests cannot be predicted. The throughput delay curve, indeed all statistical models of capacity and queuing, have little practical value in helping make decisions about future resource levels; variability is just too unpredictable. The processes and resources need to be arranged so that variability can be accommodated.

In summary, inter-arrival times of guests are largely random and there is great variation in check-in duration. Checking guests into a hotel occupies only around 20% of front desk clerk time between 4.00pm and 7.30pm. Great task variety was observed, the subject, arrival time and duration of queries and requests cannot be predicted.

4.3.1: Quantitative Data Summary

The quantitative data and supporting observations indicate that guest arrival time and process duration for both processes display a high degree of variability. There are tendencies for guests to arrive at certain times of the day but the exact number arriving at any time is unpredictable and varies from day to day. Four star hotels have mainly business customers during the week, the lumpiness of arrival patterns is due at least partly to work colleagues travelling and arriving together. Front desk clerks are required to deal with enquiries from guests checked in as well as new arrivals.

There was also great variation in the duration of each process. The coefficient for variation averaged 64% for check-in (3 out of four hotels) and 44% for breakfast. Whilst the check-in had a median duration of 2:30 minutes, median breakfast duration was 24:30 minutes.

Variation percentages therefore translate into very different chronological time differences. Observed reasons for the variation will be considered in the following section.

4.4: QUALITATIVE FINDINGS: CUSTOMER VARIABILITY

Quantitative findings describe the extent of process variation but provide little indication as to the possible causes. By watching the processes as they happen it was possible to record events and reasons that can be said to be the causes (Sayer, 1992, 2000) of the process durations. The short interviews with employees provided additional insights. The causes of variability are considered to be rooted in either customer or system behaviour. This section categorises observations of causes of customer variability. Events that speed or slow service that are directly in the control of the operation are reported and analysed in the following chapter as system variability.

It is recognised that there are causes of variability that are either outside the control of, or realistically limit the choices of, those involved in the processes, a few examples follow. While observing the front desk in hotel A the hotel fire alarm went off at 5.50pm requiring the hotel to be evacuated for 30 minutes. Guests may have their service time largely decided by their work schedule or transport times. A guest may be ready to leave the table but feels obliged to stay when joined by a colleague.

4.4.1: Customer Variability Observations: Breakfast

Guests arrived without a reservation at a time that suited them. Once in the restaurant they occupied physical capacity and stayed for a duration of their choosing. Two hotels provided both a hot and a cold buffet and two just a cold buffet; here orders were taken for hot food.

Before service the restaurant was presented with a list of names and room numbers indicating which guests had breakfast included in their room rate. It is assumed that guests who did not know anyone in the restaurant sat on a table on their own. Generally staff neither know whether any guests are known to each other nor whether they will arrive for breakfast at the same time. Table numbers are limited and cover occupancy is dictated by party size, so the number of customers expected for breakfast is not a good indication of how many tables will be occupied at any one time. Unless the party has arranged breakfast for a certain time, the arrival time of any one guest or party cannot be predicted.

It was observed, however, in all hotels that many guests did know each other. All the hotels had meeting and conference rooms and some of the delegates were staying in the hotels. Other guests appeared to be colleagues staying in the hotel but working elsewhere. Breakfast appeared to be an opportunity to reflect on events of the evening before or to discuss plans for the day ahead. On the Sunday in hotel A most guests were teams of athletes, in hotel B there was the early large tour group. Other guests in parties of four or six were observed to share tables; it is assumed that they were friends or family. The behaviour of guests makes the work of waiters more challenging as they need to monitor all tables to notice any new arrivals at a table.

A few interesting observations that highlight the variability of human behaviour were made in hotel A when the athletes came down for breakfast. The restaurant supervisor, contrary to standard practice, did not take room numbers and guests selected their own tables. The supervisor remarked that they were all on a rate that included breakfast and it was obvious who they were. She also judged that they preferred to choose where to sit and often sat with colleagues. Indeed breakfast seemed to be a social occasion for many athletes, they pushed tables together and they joined other members of their team part way through their breakfasts. Guests were assumed to be making food choices appropriate for their sport. A significant number of guests were observed to put fruit into their bags before they left the restaurant, bananas seemed to quickly disappear from the fruit basket (and eventually ran out).

Guests were observed engaged in other activities apart from eating (see table 4.6). Activity was not confined to waiting to order or for order delivery. Guests were observed to engage in activities after eating or between visits to the buffet. Frei (2006) limits preference variability to an opinion, an assessment of the experience, the definition is extended here. Customers who choose to engage in an activity are not making a request, or displaying effort or capability, they seem to be displaying a preference for doing something. Their goal is not to eat breakfast as quickly as possible. It can reasonably be suggested that guests make a decision in advance about how much time they want to devote to breakfast and arrange their arrival time on that basis.

Activities apart from eating
Talking to colleagues Reading printed material Using a mobile phone Using a computer Looking out of the window

Table 4.6: Customer activities observed at breakfast.

The restaurant cannot know in advance what food choices guests will make once in the restaurant. Some items can be kept at ambient temperature or chilled and returned to storage if unused. Cooked items are perishable but stay usable for different time periods.

In summary guests decide the duration of the breakfast process and their behaviour affects capacity utilisation. In addition due to arrival and duration time variability, the restaurant cannot know how many covers on each table will be occupied. Thus predicted arrival numbers is not a good indicator of whether seating capacity is sufficient. The restaurant cannot predict the volume of different food items that will be requested or consumed. This has implications for food preparation and ordering if over or under supply if to be avoided.

4.4.2: Customer Behaviour at Breakfast: Interview Findings

Employees made a few comments regarding variable customer behaviour that either speeds or slows service these are shown on table 4.7 below. Clearly employees are aware of the variability of customer behaviour and how it has an effect on the speed of service. There is also an indication that their role is to respond to customer demands as they arise.

Speeds	Slows or delays
Sometimes guests phone down and pre-order because they know it takes time to cook the food (hotel C)	Sometimes there is a rush when everyone comes down at the same time. (hotel C) If lots of customers come at the same time there is not a lot you can do (hotel A) Sometimes if one table has eggs others around it see and put in orders for eggs (hotel B) Sometimes they just walk in, especially if they are joining colleagues (hotel B) Lots of single customers occupying tables for two (hotel C)

Table 4.7: Comments from staff relating to customer behaviour that speeds of slows breakfast service.

4.4.3: Customer Variability Observations: Front desk

Front desk is generally the only customer service department that is manned all the time. The dominant role of staff manning it may change during the day, but it is there as a point of contact for guests day and night. Front desk variability, rather than just check-in variability, is considered here because guests approached the front desk with many requests and occupied capacity resulting in check-in guests having to occasionally and briefly wait for service. The primary goals of check-in are to confirm the identity of the customer, to ensure that all the necessary information is exchanged regarding the details of the stay and to ensure that full payment can be secured for the hotel.

The time required for check-in varies with the information needs of the hotel and customers. Customers are not uniform, the amount of information and the number of tasks required to check them in varied with the nature of their reservation. Check-in is also a social exchange where understanding and agreement is negotiated before the customer becomes accepted as a guest. Guests vary in the amount of information they need to help plan their stay, or in their need for general social interaction.

Guests approached the desk by phone as well as in person and made a variety of comments and requests, employees also undertook activities that took them away from the desk (table 4.8). There was also a great variety of queries, requests and activities at check-in (table 4.9). An initial categorisation of findings is made. When compared to the variety of activities taking place at breakfast it is very clear that front desk employees need to be able to respond to a greater variety of requests and therefore need to be much more knowledgeable than breakfast employees.

Facilities issues	• WiFi signal in room is too weak • Key card problems: Two of the hotels experienced problems with key cards. In hotel B it was reportedly due to the brand of card, in hotel D it was due to the programming on check-in • Maintenance issue reported. Hotel D was undergoing refurbishment and some rooms were having problems with the electrical supply and paint odours. • Chasing up on reported maintenance issue. • Moving guest to a new room because of unresolved maintenance issue. • Request room change, smells of smoke. • System unavailable. Software or hardware problem with terminals. • Printer: paper change, jam.
Guest request	• Doing research on the internet for a customer. • Taxi requests. • Request to speak to a guest in their room. Room numbers can't be given out by reception, the guest room must be telephoned, then it is up to the guest to decide whether they want to give out the room number. • Dinner reservations.

	• Give directions to meeting room. • Discussing travel times and wake-up call times to get to airport. • Recommendation for local pub. • Directions to shops and other hotels. • Hotel full, offers to phone other to find room. • Restaurant recommendations and directions. • Enquiries for location of town centre. • Show guest to car park. • Guest requests a few table cloths to be pressed. The receptionist is not sure whether that service can be offered and needs to check. • Drinks orders for the foyer lounge. • Additional towels. • Toothbrush and iron. • Service at the bar. • Request to change room.
Telephone	• Internal phone calls from guest rooms. • External phone calls. • Incoming call for bar manager. • Incoming call enquiring about who to talk to about weddings. • Routing in-coming telephone calls (reservations has a different line). • Hotel C with popular restaurant: taking calls for lunch and dinner reservations. • Telephone request for room service. • Incoming checking reservation details. • Incoming room rate and availability enquiry.
Luggage	• Loading luggage trolley. • Taking luggage to guest room. • Helping with luggage. • Retrieving bags from the store because the Concierge is engaged in other activities or there is no concierge. • Storing and retrieving left luggage.
Transaction	• To pay car parking fees. The car park beneath hotel A is not owned by the hotel but customers can pay their parking fees at the front desk. • Checking whether a delivery for a customer of soft drinks had been recorded. • A checked in guest disputing the refusal to allow her to use some of her "dinner and drinks" allowance to pay for afternoon drinks without food. • Late check-outs. • Guest wants to pay bill for check-out tomorrow. • Taking payment for foyer lounge drinks.

	• Miscellaneous payment. • Check-out discussing 'extras' bill and what can be transferred to the company account. • Miscellaneous expense payments.
Employee Task variety	• Typing a list of over one hundred names from OPERA to Microsoft Excel so that they could be used to print names on envelopes. • Unidentified activities on OPERA. • Unidentified administration tasks. • Checking reservation and guest details on computer. • Query from registered guest about cost of extending stay. • Taking debit or credit card swipe. • Checking meeting room postings. • Validate car parking tickets. • Printing reports. • Trying to contact housekeeping. • Putting cash in the safe. • Filling in forms for petty cash expenditure. • Looking for an iron and tooth brushes. • Going out to buy tooth brushes. • Staff training.

Table 4.8: Observed task variety, excluding check-in.

System information request	• Can't find name; trying to check into the wrong hotel or on wrong date, under different (lead) name, under company name, receptionist can't spell name. • Additional details or alterations to the registration details. • Requests for repetition of guest's name, or spelling.
Reservation status	• Walk-ins require most time as need to inform of price, collect all details and collect payment. • Pre-booked status has variable time as variable amounts of information are on the system. • Pre-registered status is fastest check-in.
Request	• Directions to venue. • Request for taxi.

	• Request for dining reservation. • Request for left luggage. • Tourist information and directions request. • Directions to the car park.
Query needed explanation / negotiation	• Query disagreement between customer reservation and details on the system. • Discussion about whether room type is what was booked. • Loyalty card membership explanation requested. • Request and negotiate room upgrade. • Query whether guest had sole occupancy or was required to share. • Query about the difference between standard and business class rooms. • Guest makes enquiry and reservation for a stay at Christmas. • Query about car parking and whether there is a discount for hotel guests. • Request to be allowed to park outside the hotel rather than under the hotel as the guest has great difficulty with walking. • Explaining about credit card swipes and the different way that credit and debit cards are processed. • Queries from guests for clarification on payment methods. • Queries about billing arrangements and payment responsibilities. • Queries from guests about room type and location. • Query disagreement between customer reservation and details on the system. • Questions about hotel services.
Actions	• Guest paying in full on arrival. • Walk-ins (no reservation). • Retrieving payment card or paperwork. • Lack of personal identification, cash or credit card, yet has reservation confirmation (check-in refused). • Hunting in bags for signed ID (credit card not signed on reverse). • Guest needs to retrieve Priority Club card from wallet. • Guests arriving in bunches (perhaps this is due to proximity to the railway station?)

Table 4.9: Observed sources of task variety in the check-in process.

Some activities, such as checking reservation details and pre-registering some guests, were related to check-in, as were some post-process tasks such as updating guest data on the system. The front desk is the key reference point for guests in a hotel and often the key point for the collection and dissemination of information (Bardi, 2006). Check-in is just one task for which staff are responsible.

Some requests required staff to leave the front desk reducing the effective capacity. This included storing or retrieving luggage, taking luggage to a room, showing a guest to a room. Historically these activities may have been the responsibility of the concierge. In two of these hotels the concierge post had been abolished, in the other two it was being phased out and the concierge was cross-trained to work on the front desk.

An important point to remember is that time is measured and perceived. The customer in the process is occupied and is choosing to ask questions so their time is purposively occupied (Maister, 1985). Customers who may be waiting for service may have different view as their time is unoccupied; they may be wondering why it is necessary to ask so many questions on check-in!

4.5: FINDINGS SUMMARY

Quantitative data revealed that, although there are patterns to customer arrivals, the arrival time of customers to both processes varies and is generally unpredictable. Process duration has also been shown to be highly variable. Time variability was largely due to customer behaviour. At breakfast guests largely choose the time span of the process and most variability can be assigned to customer preference for time duration. The hotel can control the time of food order to delivery and table resetting. Guests can affect check-in duration by the number of questions they ask, or by how prepared they are for the process. At check-in there was much greater variability as a various requests were made and questions asked. Guests continued to contact the front desk with requests and queries after check-in and non-residents also approached the desk.

CHAPTER 5: DISCUSSION OF FINDINGS AND REFLECTION ON THEORY

5.1: INTRODUCTION

The methodology argued that operations managers are pragmatic and use retroductive thinking. They start with an idea of a desired end state and then select and assemble resources that (they believe) have the necessary properties to generate the events that produce the desired outcome. Rules and methods are then devised in an effort to plan and control which properties of the objects are exercised, through activities, so that the events generated ultimately deliver the desired outcome (output).

It has been explained that customer processing operations are inherently less controllable, more variable, because of customer behaviour. A challenge of operations is to manage variability so that the desired outcome is still achieved. Robustness is the capability of a process to achieve the desired performance under actual operating conditions (Taguchi & Clausing, 1990). Robustness in this context is efficiently coping with significant variability in arrival and processing times so that customers can move through the activities at a pace that suits them, while arriving customers perceive that they are not kept waiting for an unsatisfactory period of time.

Variability and capacity utilisation are the two corners of the process management triangle that managers need to manipulate to maintain an appropriate flow of the third corner, inventory. Customers (as flow units and inventory) as well as the hotel's resources are sources of variability. If there is variability then, in operations that must limit available resources, capacity or capacity utilisation needs also to vary to maintain efficiency and allow customers to flow at an appropriate pace.

The aim of the analysis is, firstly, to identify and categorise the sources of variability in the two processes. The implications for resources and process configuration are discussed. The similarities and differences between the two processes are then analysed in more detail. The analysis then focuses on how resources and processes can be configured to cope with customer variability in the two processes.

Guiding operations management principles for managing time and variability in customer facing service processes are given in figure 2.9 and developed further in table 5.10 below, they are selected mainly from research into capacity management summarised by Pullman and Rodgers (2009) and from the books by Anupindi et al (2012) and Johnston et al (2012).

Customers (inventory) have feelings and make judgements about satisfaction, partly on how long they are kept waiting. Wait minimisation is therefore a key goal of hotel operations management. Armistead and Clark (1995) discussed the idea of the coping zone and suggested that as capacity utilisation increases, variability leads to increasing delays in service. This idea is demonstrated by Slack et al (2010) using throughput delay curves (see figures 2.8 and 4.8) and described as a crucial concept for managing throughput time by Suri (2010). If variability cannot be significantly controlled then, to avoid delays for customers, capacity to process must be sufficient to satisfy the demands placed on it.

The focus is on the rate limiting resource (Armistead & Clark, 1994), generally the service encounter at the front desk and physical capacity at breakfast. The general principles are to minimise activities that consume labour time and provide facilities, equipment and materials to allow customer to process themselves at a pace that suits them. Mostly, spare and flexible labour is used to increase capacity at times of high demand.

5.2: VARIABILITY

Frei (2006) proposed that causes of customer variability could be grouped into five categories; arrival, preference, request, capability and effort. Arrival variability has been described in the quantitative analysis. Suri (2010) characterises variability as dysfunctional or strategic. Dysfunctional variability is caused by "errors, ineffective systems and poor organisation" (p.4). This can include some of the sources of waste identified under the Lean paradigm or those categorised by Armistead and Clark (1994) as capacity leakage.

The following sections discuss observed customer variability and variability arising from the system. It groups customer variability using Frei's framework and looks at dysfunctional system variability as capacity leakage.

5.2.1: Breakfast Variability

A few key points can be made here. The hotel knows approximately how many customers are expected to require breakfast. The tendency for customers to arrive in greater numbers at certain times is known from experience. The approximate service encounter duration is also known. The precise arrival pattern or time of any individual customer arrival is usually unknown. The duration of any individual service encounter is unknown because different customers have different needs.

	A	B	C	D	All
Rooms	312	211	66	115	704
Tables	55	33	22	25	135
Covers	136	88	61	67	352
T/R	1/6	1/6	1/3	2/9	1/5
C/R	3/7	3/7	1	4/7	1/2
C/T	2 1/2	2 2/3	2 7/9	2 2/3	2 3/5

Table 5.1: Observed table and cover provision in the hotels.

At breakfast the restaurant does not know the party size and thus how many customers it will take to occupy all of the tables, neither does it know the food preferences of those customers. On average there was only one table for every five rooms and less than one cover for two rooms (table 5.1). The hotel, in essence, is relying on the randomness of human behaviour to avoid waiting time for customers on most occasions. It also relies on the experience of employees to prepare sufficient resources for service and to adapt to the patterns of demand to attempt to maintain service quality. In this situation the main tool for coping is spare and flexible capacity (resources) in the form of facilities, equipment, materials and labour.

Arrival	
Activity	Weekday tendency for arrivals to increase from around 7:15am and peak at around 8:30am. No Sunday pattern observed.
Preference	
Activity	Interaction with partners or colleagues. Reading, texting
Volume	Amount of food consumed
Choice	Food and beverage preference
Duration	Dwell time in the restaurant
Request	
Seating	With colleagues, by window, table size
Resource, food	Number of requests for cooked items or condiments
Resource, beverage	Number of requests for hot beverages
Capability	
Speed	Of consumption
Activity	Ability to self-serve
Effort	
Seating location	Unobserved
Food choice	Unobserved

Table 5.2: Examples of Sources of customer variability at breakfast after Frei (2006).

Table 5.2 groups observed customer variability according to the categories suggested by Frei (2006). Some observations do not fit neatly into one category. For example, speed of consumption may be a preference rather than a capability. Effort capability was difficult to observe and would perhaps require interviews with customers. Customers may have wanted more food or different food but they were not willing to make the effort to ask for it or queue at the buffet, some may have requested tables close to the buffet to save the effort of walking too far. An indication of effort variability was noted in hotel D. As the cold buffet was passed on the way to the restaurant, some guests were observed to have selected food from the buffet before being seated in the restaurant. As Gummesson (2007) suggests, observational research captures action but not motive. There is some assumption about motive and its categorisation.

Customer arrival and duration variability was examined in the quantitative analysis. While tendencies for patterns of arrivals and a mean for duration can be identified the extent of variability is asserted here to mean that it is impossible to predict staffing or capacity requirements at any particular time during service. Hotels cope with this by;

- Simplifying the service encounter. A brief service encounter means that each member of staff can deal with many customers with minimal waiting time.
- Providing other options for delivery, such as room service, 'grab 'n go', limited service delivery in another location (business lounge or meeting room for example).
- Extending tables to adjoining areas.
- Making customers wait.

5.2.2: Front Desk Variability

Employees on the front desk are aware of the level of business in the hotel and the number of check-ins or check-outs that can be expected. They do not know the timing, number or variety of other requests that will be made and they do not know the arrival or departure time of most customers. Table 5.3 uses Frei's (2006) categorisation to re-group the types of customer variability recorded at check-in and reported in tables 4.8 and 4.9. A key feature is the volume and variety of requests, each of which also requires different amounts of time to complete.

Arrival		
Activity		Arrivals for check-in tend to peak between 4:30pm and 6:30pm.
Preference		
Activity		Social interaction with front desk clerk
Request		
Information	Tourist	Directions, times, recommendations, advice
	Hotel services and facilities.	Availability, location, times
Transaction	Negotiating understanding	Clarification of reservation details and billing arrangements
	Negotiating agreement	Disputed billing and allowance arrangements
	Payment	Pay on arrival, bar, afternoon tea, departure, ticket validation.
Reservation	Room	Walk-in or telephone request for a room
	Restaurant	Hotel restaurant
	Other	Taxi request, book a restaurant
Services	Luggage	Storage or collection of luggage or other items on check-in or departure
	Other departments	Ironing, toothbrush, early breakfast, access to gym, bar or lounge service
Defect	Room	Noise, odours, equipment not working, key card
Capability		
Activity		Transport luggage to room
Information		Finding answers to queries
Effort		
Activity		Transport luggage to room
Information		Search or act on behalf of customer

Table 5.3: Examples of Sources of customer variability on check-in after Frei (2006).

Customer variability at the front desk is not only related to the unpredictable arrival and variety of tasks but the unpredictable duration of each task. Only duration of check-in was recorded. There is no set duration for check-in because the hotel requires different amounts of information from each customer and each customer may require different amounts of information from the hotel.

The request variety and the difficulty of categorising requests as preference, effort or capability weakens the utility of Frei's categorisation. An attempt has been made in table 5.3 so subdivide requests into categories of request. Most of these requests can be dealt with from the front desk, either directly or by forwarding requests to other departments, but they all consume an indeterminate length of time. Customers could be capable of carrying out some of the information request tasks themselves but may prefer to ask staff to do it for them, alternatively they may not know how to find out the information.

Hotel	**Total check-ins observed**	**Check-ins over four minutes**	**% of check-ins over four minutes**
A	56	8	14.3%
B	100	33	33%
C	60	3	5%
D	68	12	17.6%
Total	**284**	**55**	**19.4%**

Table 5.4: Table showing the number of check-ins that took more than four minutes.

Table 5.4 shows the number and proportion of check-ins that took more than four minutes. Jones and Dent (1994) commented that a target time of four minutes, including the pre-service wait, was set by Forte Hotels, Vallen & Vallen (1990) and the front office manager of hotel A also mentioned four minutes as an acceptable target time.

Looking more deeply into the check-in duration figures and considering only the longer check-ins (i.e. the 55 instances that took longer than four minutes) an interesting picture emerges as shown in table 5.4. For 28 of those observations field notes were recorded that indicate why the check-in took more than four minutes (see table 5.5). Although the table splits the observations into individual categories, on some occasions more than one activity extended the check-in time. On one occasion in hotel C the reservation could not be found and the hotel was fully booked. The customer, however, was a regular client from a local company that brought in significant business, so a room was found for the customer. As a result, the front desk clerk had to make calls to other hotels to check availability to be prepared to book-out a guest if all reservations were honoured. The guest later returned to the front desk to request a room upgrade, reminding the front desk clerk how much business their company brings to the hotel! On one occasion in hotel B it was noted that a guest took time to find a credit card, then had an enquiry about food and drink allowances and finally asked about the gym. As the gym in hotel B is unsupervised guests are required to sign a disclaimer form before being given a key for access. In hotel D one check-in involved a family with three rooms staying for fourteen nights. One family member arrived at the desk, the front desk clerk requested full payment on check-in which involved some discussion, and one front desk clerk then went with the guest to help bring in the luggage. When the rest of the family arrived there were a number of questions about the rooms and hotel services.

Twenty one of the observed check-ins of over four minutes were generally due to customer behaviour, mainly requests for additional information. The four occasions that involved discussions about taking deposits on arrival from credit and debit cards can be viewed as variability due to customer capability. Once the reason has been explained and understood then, on future occasions, the customer has no need to question the practice. The customer is learning how the system works.

Cause due to customer behaviour	Cause due to system
Number of questions asked on check-in (thirteen times). • About need for credit or debit card swipe and the difference between the two (four times). • Discuss details of reservation, what is included in the price, upgrades, breakfast (six times). • General tourism enquiries or just chit chat.	Can't find name on the computer system (seven times). • Perhaps several rooms have been booked and only one name recorded (three times). • The reservation was booked through a third party site and not transferred to the hotel system (twice). • Room booked with another hotel department but not on the system.
Walk-ins. Room availability and rates need to be discussed, all personal details taken and full payment (three times).	
Left the front desk before check-in completed then returned a little later (twice).	
Searching bags for proof of identity (once).	
Paying cash on arrival for reservation (once).	
In response to guest request, hotel loyalty scheme explained in a little detail (once).	

Table 5.5: Table showing reasons noted for check-ins that took more than four minutes.

Remember also that check-ins consumed only about 20% of time during the observations and that a large variety of queries and requests were made by non-residents and guests already checked in (see table 4.8). The immediacy and unpredictability of request variety and the indeterminate length of time required to deal with each request means that front desk employees need wide knowledge and high levels of social skills. Staffing levels need to be flexible to deliver the responsiveness required by customers.

5.2.3: Justifying Accommodation of Variability:

It is asserted that the customer-focussed nature of service, with the goal of effectiveness taking priority over the goal of efficiency, and the fact that service can only be created at the point of delivery and usually requires some contribution from the customer, means that resources and processes are best configured to accommodate customer variability. The nature of four star hotels and the view of the customer as a transient employee suggests that customers are more likely to be satisfied by strategies that accommodate rather than reduce their choices (Namasivayam, 2002).

Frei (2006) suggests that accommodation of customer-induced variability can be categorised as ‘classic accommodation’ and ‘low-cost accommodation’. Classic accommodation is described as providing human resources with the skills to recognise and act on the different sources of customer variability. Low-cost accommodation includes tactics such as employing low-cost labour, creating self-service options and automating some activities. Yang (2011) interviewed 97 managers of service firms in Taiwan and concluded that, in general, service firms preferred to use tactics in the classic accommodation strategy rather than low-cost or variability reduction strategies. The sample included 16 hotels but Yang provides no breakdown by industry and makes no suggestions as to the reasons for the preference. Table 5.6 shows the strategies suggested by Frei (2006) for managing customer variability, items highlighted in bold were observed (or attempted) at the hotels.

	Classic Accommodation	**Low-Cost Accommodation**	**Classic Reduction**	**Uncompromised Reduction**
Arrival	• **Make sure plenty of employees are on hand**	• **Hire lower-cost labour** • Automate tasks • Outsource customer contact • **Create self-service options**	• Require reservations • Provide off-peak pricing • Limit service availability	• Create complementary demand to smooth arrivals without requiring customers to change their behaviour
Request	• **Make sure many employees with specialized skills are on hand** • **Train employees to handle many kinds of requests**	• Hire lower-cost specialized labour • Automate tasks • **Create self-service options**	• Require customers to make reservations for particular types of service • Persuade customers to compromise their requests • Limit service breadth	• **Limit service breadth** • Target customers on the basis of their requests
Capability	• **Make sure employees are on hand who can compensate for customers' varied skill levels** • **Do work for customers**	• **Hire lower-cost labour** • **Create self-service options that require no special skills**	• Require customers to increase their level of capability before they use the service	• Target customers on the basis of their capability
Effort	• **Make sure employees are on hand who can compensate for customers' lack of effort** • **Do work for customers**	• **Hire lower-cost labour** • Create self-service options with extensive automation	• Use rewards and penalties to get customers to increase their effort	• Target customers on the basis of their motivation • Use a normative approach to get customers to increase their effort
Subjective Preference	• **Make sure employees are on hand who can diagnose differences in expectations and adapt accordingly**	• **Create self-service options that permit customisation**	• Persuade customers to adjust their expectations to match the value proposition	• Target customers on the basis of their subjective preferences

Table 5.6: Strategies for managing customer-introduced variability (Frei 2006).

There is some evidence that low-cost accommodation tactics are also used. The frontline service staff in hotels who interact with customers and ensure their satisfaction have always been low-paid. Self-service is common nowadays at breakfast, indeed it may be the preferred option for most customers. Some hotel chains, such as Premier Inn, are already installing kiosks to allow self-check-in, as has a recently opened independent four star hotel in Birmingham. There was an attempt to limit the breadth of service by the removal of menus from tables at busy times in hotel A and the omission of menus from tables in hotel B. Ideally hotels, of whatever star rating, are driven to find ways to reduce the cost of service and accommodate variability while avoiding a negative impact on customer satisfaction.

Generally eating can be regarded as a pleasurable experience rather than a functional activity. Restaurant experiences purchased for pleasure can be viewed as hedonic rather than utilitarian (Noone et al, 2008). Dahr and Wertenbroch (2000) describe hedonic goods as those consumed more for their experiential values such as fun, pleasure and excitement.

Social interaction and engagement in other activities have been shown to influence dwell duration. Time is perceived as well as measured and the passing of time may be noticed less by those engaged in activity (Maister, 1985). Generally guests sharing a table arrived at different times but left at the same time. Joining another person at a table to share a meal has social meaning and psychological effects (Nyberg and Olsen, 2010). Likewise, entering a restaurant and not sitting near or joining with a colleague may result in an unfavourable interpretation of behaviour. It is not surprising therefore that guests were observed to join colleagues part way through their breakfast and occasionally to move themselves to another table when a colleague was spotted (sometimes after an order had been given to the waiter).

Sometimes guests even pushed tables together to be closer to colleagues. People, however, do not like to be placed close to people they don't know and may experience stress. Robson et al (2011) investigated the emotional effect of table spacing on restaurant customers and reported that 70% of respondents would ask to be re-seated if the host placed them too close to other people.

Utilitarian goods are primarily instrumental and functional, but even these have an experiential dimension (Holbrook & Hirschman, 1982). Arrival at the hotel and check-in, for example, is a "critical moment of truth" and an opportunity to make a good first impression (Vallen & Vallen, 2009:288) even though it is mainly a functional activity, a necessary step to gain access to the hotel facilities. Encounters at the front desk customised in response to customer capability and requests. On many occasions this required discussion and information exchange.

Not all occupied time is pleasurable. If check-in is regarded as functional (utilitarian) rather than hedonic then the attitude towards duration time at check-in may be different. The customer may prefer a shortening of the process. Satisfaction is positively correlated with the end stages of the check-in process where guests are called by name, offered luggage assistance and thanked for choosing the hotel and negatively correlated with the stage where customer preferences are reviewed (Noone et al, 2010). This finding can be related to comments by Wilson et al (2008) and Gilbert (2007) that people do not remember all events equally, unremarkable events are forgotten and events towards the end of a process have more impact on overall assessment of satisfaction than events at the start of a process. An important role of hospitality employees is to make guests feel special and important, to make them feel welcome, even to create a home away from home (Crick and Spencer, 2010). This is an indication that not all tasks are valued equally. The shortening or elimination of tasks that engender desirable emotions could adversely affect customer satisfaction while the removal of others may have either no impact or a positive impact. It is noted that all hotels maintained the end stages of the check-in process.

A key point which can also be briefly considered here is that of control. Physical systems have no feelings or motivation and respond only in accordance with physical laws. Employees have entered into a contract with the hotel and have agreed to subject themselves to the control of the employer and limit their behaviours. The control that can be exercised over customers differs greatly among services but is generally much less than that exercised over employees or physical objects. It is important for customers that they perceive that they are in control (Namasivayam and Mount, 2006), that they have choices. The need for customer choice necessarily results in service demand variety and variable duration.

What customers seek and expect from hospitality is fundamentally different to what is sought from other services. This point is relevant because it places satisfaction of customer need firmly before any need for cost reduction through excessive time and service reduction. In hotels the physical capacity to contain customers each day is severely restricted and the contribution that each room sale makes towards paying fixed costs is significant. Hospitality has historical associations with domestic service and the traditional view of that relationship is that the primary purpose of the hotel and employee is the satisfaction of the needs of the customer. There are many alternatives for customers who are less than delighted with the service. Contrast this to a bank or retail operation that has many thousands of customers each contributing relatively little to the profit of the organisation. Contact with banks is brief (mainly) is for utilitarian reasons. Generally competition is based on the need to minimise costs. Further, in retail the primary objective of customers is the goods on sale, the behaviour of service staff, while important, is very secondary.

This examination and comparison could be extended to other types of service, such as call centres for 'break-fix' requests or services of necessity such as hospitals. The key point is that each is different and the design of the process must be balanced to accommodate the goals of those who hold the dominant power to ensure the long term survival of the organisation, and will continue to do so if satisfied. Organisations are constantly trying to balance cost control and customer satisfaction.

These factors offer an explanation for the more common decision to adopt classic accommodation solutions for customer variability. At busy times non-essential steps can be reduced or eliminated but customers must always be in control of when the process ends. The breakfast process is largely open-ended. The hotel facilitates the customers' experience creation and leaves the customer to decide the pace and duration. Check-in is more like an administration task, a necessity rather than a pleasure. Being hospitable, making people feel welcome and valued is a core feature of the hospitality industry (Crick and Spencer, 2010). This requires the expression of empathy and responsiveness (Parasuraman et al, 1985) rather than limitation and control of customers.

5.2.4: System Variability

The resources and processes in the control of the hotel can also be causes of variation in throughput time. This may be due to the properties of the resource or process or due to resource availability. Variability affects throughput time. Time is a component of capacity, so system variation can be viewed as capacity leakage.

Table 5.7 shows the events at the front desk and breakfast that employees reported slow throughput time and categorises them using the capacity leakage categories in table 5.8.

Slows	Leakage Category
Pre-service	
Front Desk:	
We used to have a dedicated telephone switchboard department, but due to the recession, this was cut. There is a computerised system for incoming calls that gives callers options to follow (A)	Scheduling loss due to insufficient resources.
I am aware of the phone issue (phones ringing unanswered because all desk clerks are busy). Usually we like to have someone working in the back office to answer phones, but some staff are away (B)	
Sometimes at weekends web sites are left open to sell when the hotel is full, resulting in overbooking and having to book out (D)	Quality failures due to ineffective process design or underperformance.
If guest has booked online but Head Office has not put the reservation on the system (D)	
Breakfast:	
Job roles are not clear (A)	Labour underperformance resulting in quality failures
Lack of knowledge / training (A)	
Learnt room service by trial and error (A)	
Supervisor / RM does not have enough time to train (A)	
Lack of inter-departmental cooperation (A)	
Different chefs have different procedures (A)	
In-service	

Front Desk: Errors, missing reservations, errors on the booking, incorrect billing instructions (A)	Quality failures due to ineffective process design or underperformance
For others it is hard to estimate the time for check-in, people we don't know, strangers to us, have to give a credit card (and have a pre-authorisation) (A)	Uncontrollable
We have certain standards, things to ask. (B)	Underperformance and quality error
The duty manager is not always available to help (D)	Insufficient labour
Breakfast: Going for a break slows service. If the chef goes for a smoke (B)	Underperformance
If not enough cutlery polished slows. Time for table resetting if not enough mise-en-place (B)	Scheduling loss
Most things relate to speed, for example if everything isn't got ready before service (B)	Underperformance
Breakfast chef doesn't always do things unless the head chef is there (A)	Underperformance
Shortage of staff. Staff morale is affected (A) Sometimes when it is busy we could do with two breakfast chefs (D)	Underperformance Scheduling loss
Sometimes we don't have enough staff (B) Night Porter leaves a mess (in the kitchen) that needs to be cleared before we can start (A)	Scheduling loss or absenteeism
Post-service	
Front Desk: NA **Breakfast**: If tables are not cleared and reset quickly enough (D)	Change overs

Table 5.7: Reported and observed system events that slow throughput at different stages of the check-in and breakfast processes.

The observed hotels have replaced, or are about to, their internal telephone exchanges with automated call systems as a cost saving measure. Reservations is only manned until the early evening after that time all telephone enquiries go to the front desk. The front desks in all hotels were receiving internal and external calls. If front desk clerks were occupied with guests the telephones were unanswered and no opportunity was provided for callers to leave a message. This is an issue connected with customer service and only affects throughput time of check-in if the clerk is talking on the telephone instead of serving the guest present. System events affecting throughput time were mainly due to ineffective organisation of tasks leading to underperformance or quality failures. Insufficient resources resulted in delays or non-service for those on the telephone.

Armistead and Clark (1994) presented a model of capacity management (see figure 2.2) Table 5.8 adapts this model to include categories of capacity leakage in Johnston et al (2012).

Capacity Leakage	
Labour lateness / absenteeism.	Insufficient labour resulting in reduced effective capacity and perhaps bottlenecks.
Labour underperformance.	Varying knowledge, motivation or capability of the workforce.
Quality failures.	Rework due to imprecise equipment, substandard materials or employee errors, perhaps due to lack of training or insufficient operating procedures.
Scheduling losses.	An imbalance between supply and demand resulting in idle capacity or more demand than capacity can satisfy.
Complexity	A broad range of services may mean that staff may experience requests that are not part of their daily routine. This may require help from others or re-learning.
Change-overs.	Capacity unavailable while it is prepared for the next customer.

Table 5.8: Sources of capacity leakage, adapted from Armistead & Clark (1994) and Johnston et al (2012).

The capacity leakage section of the table indicates sources of variability introduced by the operational system. The findings do not represent an exhaustive list of possible causes. Table 5.5 reported observed reasons for check-ins of over four minutes, some of which were due to the system, errors also generated requests at the front desk (see table 5.3).

System errors, such as faulty key cards, missing reservations or faults in bedrooms can affect customer satisfaction but were not a major source of observed time duration variability. System errors are dysfunctional (Suri, 2010) and abnormal variability (Anupindi et al, 2012) and mostly treatable and controllable over time.

5.2.5: Variability Summary

In manufacturing literature variability is regarded as the enemy of smooth flow and productivity (Schmenner, 2004). The greater the degree of customer interaction the greater the opportunity for customer induced variability (Chase 1981; 1983, Morris and Johnston, 1987). Findings indicate that the two greatest sources of customer variability at check-in are arrival and request variability while at breakfast it is arrival and preference variability. Preference and request variability directly affect throughput time, but in different ways. Preference variability was expressed in the consumption of customers' own time and required facilities and materials to accommodate it. Request variability consumed employee time and thus required constant variations in the number of employees available to satisfy requests.

Hotels accommodate variability at the front desk by varying the number of staff available and ensuring that they are trained to respond to the variety of requests expressed. It will be revealed later that employees cope with arrival variability by omitting unessential check-in steps and by being reactive rather than proactive with customers. The main hotel resource that customers occupy in the restaurant is space, while at the front desk it is labour time. At breakfast service encounters are very brief, customer labour is used in the restaurant to absorb the variable demand for labour that accompanies service. Breakfast duration is uncontrollable and the main limiting resource is the physical capacity.

The system can also be a source of variability and resource limitations can lead to customers being kept waiting. Generally the main system issues were the organisation of work leading to labour underperformance and quality failures. In short, there is a variable load on services and variable process time so there needs to be sufficient physical and labour capacity, or the ability to vary capacity, if customers are not to be kept waiting. The physical design and thus capacity of a hotel is fixed in the short term.

5.3: PROCESS CATEGORISATION

Service processes can be categorised as professional services, service shops, mass services and service factories (Schmenner, 2004). Slack et al (2009) reduce the categorisation to three as shown in figure 5.1. Tasks at the front desk more closely fit the description of professional services with low volume and high variety, tasks are diverse and, at times, complex. Breakfast service more closely fits the description of a mass service where task variety is low and volume is periodically high, generally tasks are simple and repeated. Strategic variability (spare capacity) is described as desirable for low volume and high variety producers because it provides the capability to cope with unexpected changes in demand without degradation of service, to offer product variety and customised products to customers (Suri, 2010).

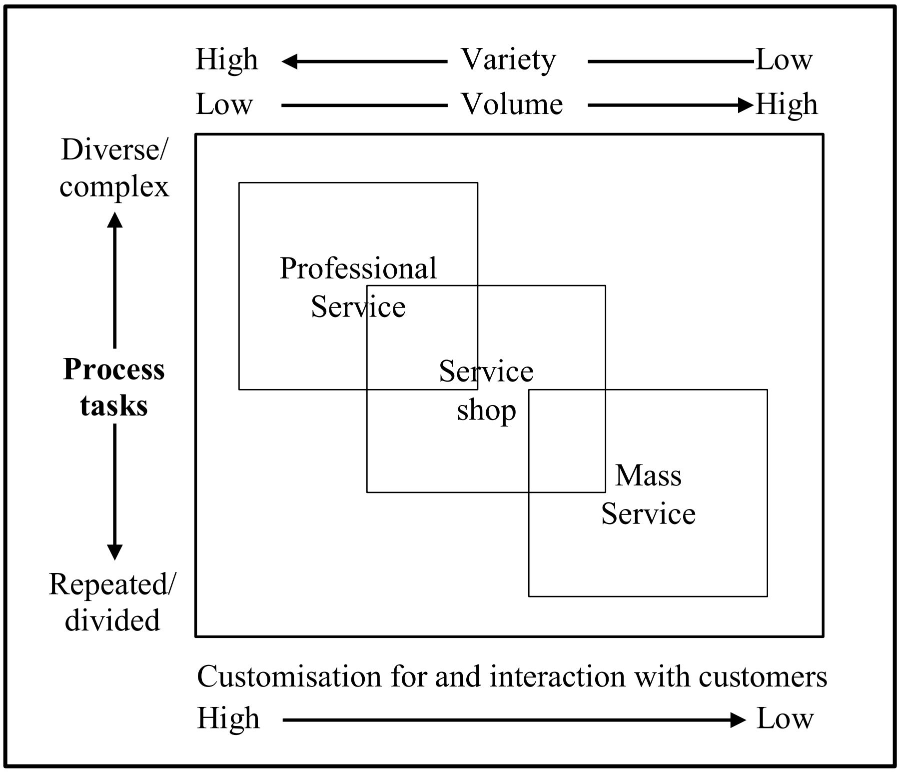

Figure 5.1: Features of different process types
(adapted from Slack, 2009 and Schmenner, 2004).

Service encounters tend to be very brief in mass services (Schmenner, 2004) but this does not necessarily mean that throughput time is short. Many services have little or no employee contact but customers can occupy facilities or equipment for significant periods of time, for example, computers in a university or internet use. Breakfast service had short encounters but a relatively long dwell time (median of 24:30 minutes) and demand is squeezed into a short period, peak breakfast arrival time was noted as between 7.15am and 8.30am. While breakfast could be delivered to the room or consumed as 'grab 'n go' the vast majority of guests preferred to eat in the restaurant.

In contrast at the front desk information is being processed one-to-one with the customer, only check-in duration was recorded (median of 2:35 minutes) but most requests required only a brief amount of employee time. Flexible labour and flexible task engagement are used to accommodate the arrival variability. Requests for service were not confined to a short time period and were intermittent, employees were able to engage in tasks that do not require the presence of the customer, thus when no customers are being served staff are still gainfully employed. The customer also occupies labour capacity throughout the process.

Thus at breakfast one flow unit occupies up to one table (unit of physical capacity) but demands very little labour capacity; one employee serves many simultaneously. In contrast each flow unit at check-in occupies one unit of labour and one unit of physical capacity throughout the process.

Johnston et al (2012) use a slightly different framework for process classification as shown in figure 5.2. High capability processes tend to be those associated with professional and luxury services, commodity processes share the features of mass and budget services. Breakfast service is closer to the description of a commodity process with high volume and low process variety. While it may appear that there is variety of choice at the buffet, this variety is delivered by customers to themselves. The style of breakfast service experienced in a variety of types of hotel is very similar to that observed in the four star hotels, however, in cheaper accommodation the variety of product choice for customers tends to be less. Self-service can therefore be used to accommodate variety and customisation in low interaction services.

The front desk is closer to the description of a capability process. It experiences high request variety which necessitates less definition of processes (to allow customisation to the needs of the customer and activity) and a higher knowledge capability of operators to adapt to the process variety. Figure 5.1 indicates that task division and repetition are process features that increase as processes move from being professional to mass services. As noted, some hotels either had no official check-in procedure or only guidelines. The variety of requests makes it unlikely that a set procedure could be prepared for each. Task and request variety at breakfast was much less and staff were allocated different responsibilities during service.

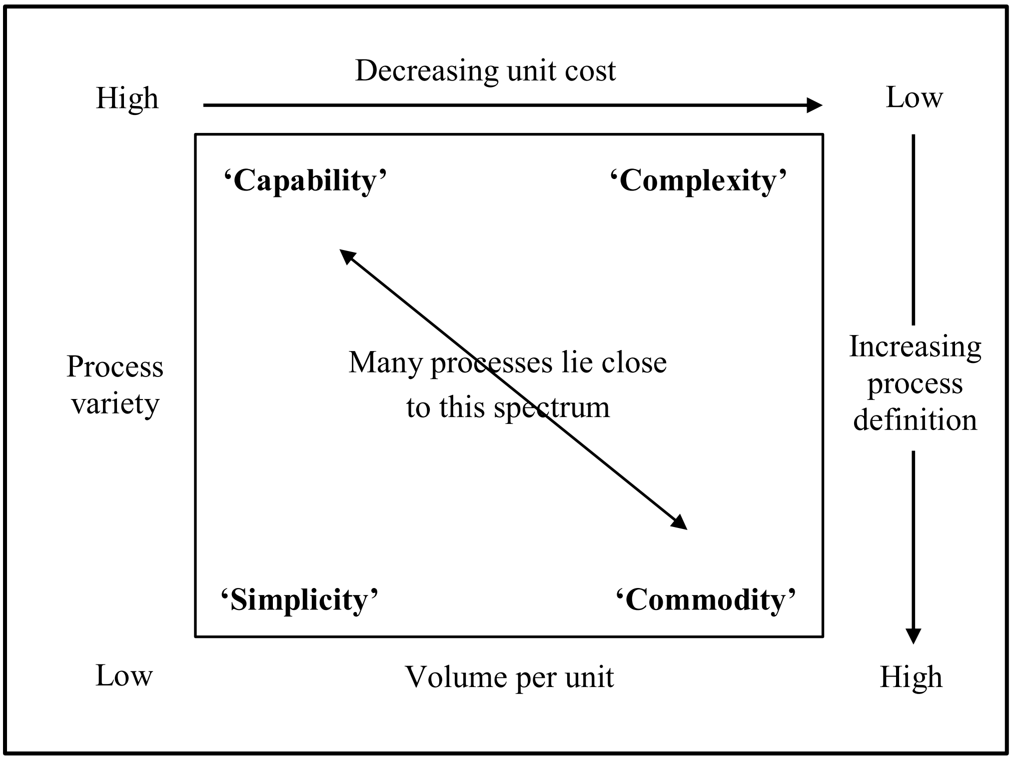

Figure 5.2: Volume-variety matrix (Johnston et al, 2012:197).

The contingency-based model (figure 2.7) presented by Posignon et al (2012) categorises processes as following either a focus or cost leader strategy. The cost leader strategy shares the features of the mass service and commodity categorisations above and suggests that there should be reduced customer contact and specialist employees with a low skill level. The focus strategy is very similar to the professional service and capability categorisations and recommends employee empowerment and employees with a high level of skill. Generally this was what was found in the observed processes. But service processes need to be responsive, especially when the customer is present and experiencing the passing of time. Johnston et al (2012) recognise that both capability and commodity processes need to be responsive and, even in commodity processes, this can require some empowerment of employees to deviate from the standard.

It is clear that the processes observed can be categorised in different ways and that some processes in a four star hotel may have very similar features to those expected in a budget hotel. In fact it requires some 'shoe horning' to place full service hotels of any standard into a single category in any categorisation model. The dominant need in mass services is for physical capacity, in professional services it is for labour capacity. All hotels need to retain a level of responsiveness and, except perhaps at the budget end, a willingness to customise to some extent.

5.4: SUMMARY COMPARISON OF THE NATURE OF THE TWO PROCESSES

As discussed in previous sections there are similarities between the two processes investigated, for example, unpredictable patterns of arrival and variable process duration. There are also fundamental differences in how the customer views the process which impact on appropriate actions towards throughput time (see table 5.9).

Check-in only	Breakfast only
Common:	
Unknown arrival time. Heterogeneous customers involved in activities. Must serve all customers present. Modify actions in response to demand. Speedy response to customer requests. Variable activity duration.	
Key Flow Unit processed with Customer:	
Information	Materials
Dominant process nature:	
Utilitarian / functional.	Hedonic / experiential.
Employee activities:	
Wide variety of tasks requiring wide knowledge. Constant contact with single customer. Has some influence on process duration.	Little variety of tasks. Brief and intermittent contact with many customers. Very little influence on process duration.
Employee attributes:	
Requires wide knowledge. High level of communication skills. High level of social skills.	Requires little non-task knowledge. Average level of communication skills. Good level of social skills.
Customer activities:	
Exchanges and negotiates. High variety of possible queries and requests. Customer responds to employee actions. Customer spends little time in activity.	Assembles and consumes. Low variety of possible queries and requests. Customers need space and materials to act. Activity time mostly consumed by customer. Customer exercises preference for duration.
Main rate-limiting resource:	
Labour	Space
Duration:	
Usually less than four minutes.	Usually between fifteen and forty minutes.
Dominant in-process variability:	
Request volume and variety.	Duration preference.
Process Categorisation	
Service shop and professional / capability service	Service shop and mass / commodity service
Output or outcome:	
Becomes guest. Key to room.	Consumed. Satisfied.

Table 5.9: Process characteristics.

5.5: CAPACITY OF LABOUR AND CAPITAL

The three corners of the process management triangle are variability, capacity utilisation and inventory (Klassen and Menor, 2007). The sources of variability in process duration have been revealed and some differences between the processes discussed. There is high variety in arrival and process duration in both processes. Customers need to feel that their various needs are met so the aim is to accommodate the variable flow of customers (inventory) rather than make them wait in buffers (queues). This means that capacity must be designed to cope with the variability in arrival and processing rates.

Figure 2.9 summarises the key sources of variability uncovered and illustrates the two basic responses required to manage variable demand. There needs to be spare or flexible capacity available in the form of capital and labour. Activity consumes time so the number or duration of the operator's activities needs to be contained or reduced. Actions implemented to achieve this are illustrated and important modifications highlighted. Customers and processes are goal orientated so solutions must be designed to achieve the goals. Generally, for the understanding of the figure, humans can be thought of as having competences while facilities and equipment have capabilities. Different services satisfy different needs of customers. Hospitality customers feel that the operation is there to satisfy them, allowing them to feel that they have choice and control is an important moderator of time reduction initiatives. The process must also accommodate the human need for social interaction.

Observations suggest that the hotels largely responded to customer variability by using flexible labour, space and queuing. At busy times staff in all hotels attempted to reduce the interaction time by limiting the information given and questions asked to guests. At quieter times staff were able to respond to perceived customer need for 'chit-chat'. One receptionist in hotel B was observed to enter a lengthy conversation with a guest about their common home country.

Capacity consists of the resources available to the operation, generally labour and capital. Capital is provided in the form of facilities and equipment. Capacity is also defined by the rate at which flow units are processed. Table 5.15 lists principles that can be applied pre-process and in-process to remove time and thus increase the capacity to process.

Activity has duration and pace (Noone et al, 2008). The two basic options are to remove an activity or do it more quickly. According to Seddon (2005), Ohno relates that the principles he applied to the Toyota Production System were designed to speed up the production process, this was achieved by the removal of waste, waste being anything that does not add value (Ohno, 1988). Classing an activity as waste and removing it increases the time available to employees for work that does add value. In simple terms this is what all the duration reduction and process simplification tactics are also aiming to achieve.

<u>**Capacity improvement: Removing time:**</u>
Service encounter brevity (process design):
o Move activities off the critical path:
    o Move activities to pre-service encounter or post-service encounter.
o Reduce the duration of activities:
    o Identify and eliminate non-value-adding activities.
    o Simplify the product or service.
    o Reduce the frequency of service encounters.
o Give more work to customers.

<u>**Capacity improvement: Labour and capital**</u>
Employee labour:
o Pre & in-service tactics affecting duration:
    o Allocation of tasks to employees to ensure process objectives are achieved.
    o Monitor service load and adjust resources and activities as required. Concentrate on the critical path and bottleneck.
    o Do it right the first time:
        ▪ Conformance standards: Standard way of doing the job.
    o Shorten the duration of activities:
        ▪ Omit activities that are not essential but may be part of the standard operating procedure.
        ▪ Do not seek queries from, or interaction with, customers.
        ▪ Complete activities in parallel instead of serially.
    o Work faster, increase the pace.
o Vary labour volume by using:
    o Trained part-time and casual staff.
    o Cross-trained (flexible) labour.
o Properties: Responsive, reliable, empathic, competent, motivated.
Capital: Facilities and equipment:
Facilities:
o Sufficient space to accommodate all customers on most occasions, this may include rooms that have more than one use.
o Alternative location of delivery, for example, room service.
o Properties: Layout for ease of access and minimal travelling.
Equipment:
o Sufficient well maintained equipment to serve all customers on most occasions.
o Flexible (e.g. table size) to adapt to party size.
o Self-service equipment.
o Properties: Ease of use, speed of processing, reliability.
Materials:
o Sufficient materials to meet demand.

<u>**Supporting the front-line**</u> (pre-service planning and organisation): o Recruitment and training: Select capable employees and train them. o Maintenance procedures: Keep equipment working. o Demand management: Influence arrival times to reduce waiting in line. o Demand forecasting to identify required resources and put them in place.

Table 5.10: Principles to reduce or accommodate variability so that appropriate throughput time is achieved.

5.5.1: Process Design

The role of process design here is to think about the removal of time from processes at the design stage so that the normal way of working consumes less time. The focus is mainly on reducing service encounter time so that the customer processing capacity of employees is increased.

5.5.1.1: Move activities off the critical path

The service encounter is the point at which employees and customers interact; it is on the critical path. Encounter brevity does not necessarily mean a shortening of the whole process, instead it focuses on reducing the amount of time that each employee spends with the customer. Reducing the amount of time spent with a customer increases the processing capacity of employees.

Where arrivals are lumpy systems experience times when there are no customers waiting for service and employees need other activities to keep them occupied. Activities can be moved to pre-encounter or post-encounter. If the activities are uncomplicated then it may be possible to give them to customers or capture the knowledge in equipment. At breakfast the service encounter consumes only one or two minutes of a process with a median observed duration of a little less than 25 minutes (see table 4.1), mostly duration is controlled by the customer. At check-in the customer retains the option of asking questions that inevitably extend the duration of the check-in process.

Some tasks are undertaken in preparation for arrival so that the customers can be served more quickly when they enter the process, for example, mise en place speed table resetting and some items can be cooked and held at a safe temperature, pre-arrival check-in of groups and regular guests on the computer system speeds them through the check-in process.

There are activities that are part of the process but do not require the presence of the flow unit for their completion, for example, the details entered by the customer on the registration card do not have to be entered onto the computer system before the guest is checked-in and leaves the front desk. This means that, in a system that has variable arrival times, staff can store up activities to complete when no customers are waiting for service. It was observed that front desk staff were rarely idle when customers were not in front of them. This time was used for training, updating records, checking room postings and preparing for future arrivals. In the restaurant staff used quite times partly for preparing more mise en place, however, the range of tasks required was more limited and some time was spent idle. Priority was always given to the customer present and the number of staff engaging with customers was seen to respond to demand.

5.5.1.2: Reduce the duration of activities

Simplifying the process is about reducing the amount of knowledge and level of skill, making it more like a commodity process. Reducing the duration of activities is about finding a way to deliver the same outcome in less time. Each of these tactics may also involve waste identification and elimination. Simpler processes are also less prone to error and may be straight-forward enough to either give to customers or incorporate into equipment.

Processes can also be categorised in terms of their frequency and complexity as runners, repeaters or strangers (Bicheno, 2008 and Johnston et al, 2012). A simpler process, such as breakfast service that is more of a commodity has uncomplicated tasks that are frequently repeated. The process variety observed at the front desk indicates that there is much more of a mix of the three types. Being a stranger (rarely occurring) does not necessarily mean that it is a complex task, as indicated by the simple request in hotel D for a toothbrush, after much searching one front desk clerk had to go to the supermarket to buy one. Generally, simplifying a process reduces the opportunity for error and enables the operation to consider giving it to the customer to complete.

Tables 5.11 and 5.12 describe the observed common elements of each process to build up a picture of the process in action rather than as it is described in any of the SOPs. The process in action is a list of the activities commonly observed to make up the process.

Guest activities	Staff activities
Arrives at restaurant reception desk. Usually waits for direction unless sees colleagues.	Greets and asks room number and checks how many in the party. Checks on a report to see if breakfast is included in the rate, if not the cost and billing options are explained.
Goes to a table.	Directs or guides guest to a table. Procedure for service either explained on the way or on arrival at the table.
Arrives at table. May not sit at this point but proceed to a buffet to choose food. May enquire and requests a certain type of tea or coffee. If food is cooked to order the guest may give the order straight away or ask for a few minutes to read the menu.	Asks if would like tea, coffee. If food cooked to order (hotels C and D) toast order is taken at this point and guest asked if they would like a cooked breakfast or would like to look at the menu.
Chooses food items from the buffet.	Delivers beverages and toast (if ordered).
	Visits to remove dirty plates and check needs and satisfaction.
Guest consumes.	Hot food delivered if ordered.
Guest may make repeated visits to the buffet, eats, perhaps chats, reads or just looks out of the window.	May be additional visit to remove dirty plates and check needs and satisfaction.
Guest leaves.	If noticed, acknowledged and wished a good day.
	Table cleared and reset. If near end of service may be set for next meal service or left clear.

Table 5.11: General process for breakfast service.

Table 5.11 shows the general steps followed at breakfast. The service encounters are mainly at the front end of the process, once the guest is provided with beverages or a food order is taken they are largely left to consume at their own pace. If guests wish further service then they either have to wait for a check-back visit or attract the attention of a server. Priority is given to settling arriving guests, so dirty plates are either removed on passing or when there is a lull in arrivals. Each member of staff may have to serve 30 customers in a shift, and the more often the table has to be visited, the more time is spent travelling. This travelling is transport and motion and may be a waste of time (Ohno, 1988; Slack et al, 2010). Each visit to a table represents a service encounter. Finding ways to reduce the number of visits to tables and make them purposeful is key to increasing the capacity to serve and reduce waiting time for customers.

Greeting and seating can aid the speed of service, but it also serves an administrative purpose. The identity of arrivals is checked to ensure that they are a guest at the hotel, a check is made to confirm whether they have to pay for breakfast. The journey to the table can be used to explain the service method. Capacity to serve is improved if work is arranged so that each guest is approached once. Where breakfast was entirely self-service guests needed to be approached for their tea and coffee order and (theoretically) to ask if they want any option on the menu. Where orders for hot food were taken guests were given the opportunity to give their order while being seated.

Some activity time can be regarded as waste if it conforms to one of the seven sources of waste associated with the ideas of the lean approach (Slack et al, 2010). Duplicated work and seating errors consume time that does not add value and, as such, are waste. In hotels A and B customers were forced to wait while the buffet was restocked, they were also required to queue to use the toaster. This does not add value for the customer and, at least from their point of view, is a waste of time. It can also be viewed as unoccupied time which, according to Maister (1985), feels longer than occupied time. If the customer is choosing food or consuming food while waiting for the delivery of an order then that time is not waste from their viewpoint.

Mostly in hotels A, B and D checking in a guest started with finding the name of the guest on the reservations system. Software acts as a guide and rigidly imposes steps on the user. All hotels used the same software on the front desk so the sequence and steps followed are very similar. Hotel C followed a different tactic, generally rooms were pre-assigned and registration cards pre-printed, system check-in was generally conducted after the guest had left to go to the room. Note that hotel C had a median check-in time of 1 minute and 52 seconds, 30 seconds faster than hotel A and 90 seconds faster than hotel B, however it should also be noted that 4 minutes was regarded as an acceptable time target by Vallen & Vallen (2009) and the front office manager in hotel A. Table 5.12 shows the general check-in process, although this did vary slightly between hotels. The guest is guided through the process, interacting with the employee until the process is complete.

Guest activities	Staff activities
Arrives in foyer and either joins the queue or approaches the front desk.	If the clerk is busy eye contact is avoided until ready for the next guest.
At the front desk. Guests usually announce the reason for being there and give their name or the name under which they think the reservation may be made.	Eye contact, smile, greet. Will ask how they can help if no reason is given. May ask the guest to repeat or spell the name. If system does not indicate, may ask at this point if they have stayed before.
Guest finds card, says no to loyalty offer or asks more about it.	Ask if guest has a loyalty card, if not whether they would like to join. May need to respond to guest questions or find leaflet about the scheme.
Respond to any comments or questions. If been before a preferred room or location may be requested.	Check-in screen selected and loaded. Part of name typed in and a list starting with those letters appears. If the name appears more than once the first initial is requested. May ask about their journey or comment on the weather to avoid silence while the system finds the reservation. Guest may be offered a choice of room location.
Guest may do one of the following; Enquire if under a company or lead booker name. Search self or phone for reservation confirmation. Make a telephone call.	If not found the guest is asked for a copy of the reservation confirmation. May need to search under a different name or call a reservations agent just in case the reservation has not been transferred to the hotel system.
Guest confirms or disputes details. Guest may need to think a moment about breakfast before giving response.	Details are checked verbally. If address is missing a post code is requested; system looks up addresses at that post code; guest is asked to confirm house number. If breakfast is not included in the rate they may be offered opportunity to add it at check-in. May require phone call to a reservations agent or booking agent to check details.
Guest finds and produces passport.	If non-UK guest a passport may be requested and photocopied.
Checks and signs, usually in two places, the registration and the key card wallet.	Registration card printed. Guests asked to check details and fill in any missing contact

	details. An email address and mobile phone number is often requested.
Guests may ask for explanation as to why this is necessary or how this system works. Guest retrieves card and enters pin.	A credit or debit card may be requested to have preauthorised sufficient funds to cover the room price and a sum for extras, such as food. This also helps to confirm the identity of the guest. Further explanation may be required.
Guest responds to offers.	Cuts the electronic key while the registration form is being signed or the preauthorisation is being processed. Usually offered a wake-up call and newspaper.
Guest responds to offers.	If guest has stayed before then this step may be omitted. Additional information about hotel services such as internet access, breakfast location and time, dinner location and time, gym. May be asked if a dinner reservation is required.
Guest responds to offers, rarely wanting help with luggage.	Help with luggage is offered, directions to room given, pleasant stay wished.
	After the guest has left and if there is no one waiting additional details gathered are entered into the system and the registration card stored.

Table 5.12: General check-in process.

Some tasks are carried out in preparation for the arrival of guests. Examples include checking the reservation details in correspondence against the actual details on the front office system, or speeding check-in for groups and regular customers by checking them in on the system and cutting room keys prior to arrival. Some tasks were completed post check-in, such as completing guest address details or putting credit card details on the system.

There are several objectives of the check-in process, most of which are administrative. It is important to confirm the identity of the guest to ensure that they are who they claim to be and that they are matched to the correct reservation. The hotel also wants to minimise the risk of loss, preauthorisation both helps confirm the identity of a guest and ensures that the hotel will receive payment for goods and services provided. Some guests have pre-paid for the accommodation, whilst others have arrangements in place for the bill to be settled by a third party. A few guests have an arrangement that gives them an allowance for additional expenditure, usually this is limited to food but may also include an allowance for drinks. Once the process was explained guests were compliant and allowed preauthorisation. Guests are learning the expectations of the system.

Group guests are usually pre-registered to speed check-in. The mini bar is locked and the room telephone barred from making external calls (hotel A and B), if guests want these services then they have to return to the front desk and offer a card for preauthorisation. When group guests arrive they are usually presented with a registration slip to sign and are given a pre-cut key for their room. If the group is from overseas then at least one passport may be requested for copying (hotel B).

	A	B	C	D
Acknowledge and greet	X	X	X	X
Name	X	X	X	X
Stayed before?	X	X		X
Loyalty Club member?	X	X		
Want to join?	X	X		
Check room type and duration	X	X	X	X
Request passport	X	X		X
Add breakfast?	X	X		X
Request payment card to swipe	X	X	X	X
Print registration card	X	X		X
Ask guest to check details and sign	X	X	X	X
Cut key	X	X		X
Describe hotel services, facilities and times	X	X		X
Dinner reservation?	X	X	X	X
Newspaper?	X	X	X	X
Wake-up call?	X	X	X	X
Direction to room	X	X	X	X
Help with luggage?	X	X	X	X

Table 5.13: Steps frequently observed during check-in.

Table 5.13 shows the frequently observed check-in steps in each hotel. Observations noted that hotel C had the shortest median check-in duration (see table 4.4). It can be seen from table 5.13 that it had reduced the number of check-in steps. The registration card was pre-printed, there is no loyalty scheme to communicate. No key was cut because traditional keys were used, details of the hotel's facilities were not given and (contrary to statutory instrument 1972/1689) details of passports were not recorded.

There is evidence that the check-in process has been standardised over time by the application of technology. Information and Communications Technology standardises processes as software and thus captures some of the knowledge of how to perform a process. The software captures tacit knowledge making it easier to learn the check-in process and reduces the opportunity for employee error. All hotels used the same front office software so software differences cannot account for different mean check-in times. Booking systems can pass reservation information to hotel systems reducing the need to collect or re-key data such as address details. It was observed however on frequent occasions that guest addresses and even names were not presented on the check-in screen on arrival. Insufficient or incomplete information is being keyed into the system by other departments, speeding their tasks but slowing check-in.

Observations indicate that hotels take action to reduce the number of activities and the duration of activities using the tactics in table 5.10. Employees make further reductions when they perceive that customers are being required to wait for service. Customers are permitted to set their own pace at breakfast but may be subtly discouraged from extending the check-in process.

5.5.1.3: Customer Labour

Self-service allows the organisation to substitute employee labour with equipment and customer labour. Process activities are passed from the employee to the customer reducing the time that each employee is required to spend interacting with customers or completing tasks on their behalf. This reduces service encounter duration allowing fewer staff to cope with a larger number of customers. In the case of food self-service it removes the time required to read menus, the wait for the order to be taken and the wait for food preparation. Potentially this shortens meal duration and increases table turnover. Self-service requires that customers are capable of doing the work and are motivated to do it themselves. Frei (2006) reported that the preference for customers at one bank was to be served rather than to serve themselves. A detailed discussion of motivation and capability is beyond the scope of this paper. Utility (control, saving time, saving money), social acceptance and enjoyment can be motivators according to Curran and Meuter (2007). Kim et al (2012) suggest ease of use, saved time and overall convenience are important.

None of the hotels had facilities for self-service check-in. All four provided self-service for cold breakfast items, hotels A and B provided self-service for hot items while hotels C and D had waiter service. Table 4.3 revealed that guests who ordered cooked breakfast stayed a median time of twenty eight and a half minutes while guests who did not order hot breakfast stayed for a little over twenty two and a half minutes. These findings indicate that self-service of hot food at breakfast has little impact on dwell time.

Hot food service is designed to be speedy. Some food items can be cooked in batches in advance (pre-service) and held at a safe temperature for some time, these tend to be the items that take longer to cook. It is mainly eggs that need to be cooked to order. Hotel A placed a cook behind the hot counter to fry eggs; other orders were directed to the kitchen. Research by Hwang and Lambert (2009) reported that customers report being satisfied with order to delivery waits of up to fifteen minutes in a casual dining restaurant. Approximately 10% of breakfast orders took more than fifteen minutes to deliver, the longest wait being twenty two minutes. It was reported that hotels had only one breakfast chef, so a number of orders in quick succession can quickly lead to a backlog and delays. To keep customers occupied during the wait employees attempted to take hot food orders at the time of seating, customers could then pass the time eating cold items or toast. Hotel C reported that some regular guests telephone the restaurant with their order so that it can be ready shortly after their arrival. It was noted that a very few guests started to appear a little agitated after 10 minutes waiting. It also needs to be remembered the researcher was surprised how many guests did not appear to be in a hurry and spent significant amounts of time occupied but not eating.

Check-in occupied only around 20% of front office staff time, the most observed source of variation was the range of customer requests. If time is to be removed from front office processes then the reduction or elimination of other front office tasks also needs to be considered. Where the service requires only information then information technology is the required self-service tool.

Research into self-service technology assumes the cost saving benefits and concentrates mainly on the suitability of technology and its effect on customer satisfaction, for example Kim el al (2012). Technology that moves parts of the check-in process to the time before the guest arrives at the hotel clearly can have an impact on check-in time. Technology that allows guests to use mobile phones as room keys has existed for several years. Openways (www.openways.com), for example claims that its technology is compatible with over 5.8 billion phones. Guests can check-in by computer, mobile phone or telephone before arriving at the hotel. A text and an acoustic key are sent to the customer.

In summary self-service can pass tasks to the customer reducing employee labour input. Consumable items can be self-selected by customers but only if they are not immediately perishable. Technology offers the scope for passing information tasks to customers.

5.5.2: Removing time in-process

Observations suggested that employees respond to the increasing arrival rate by adjusting they content of work. Sometimes steps were omitted from the check-in procedure. Employees 'cut the chit-chat', and focused on essential conversation.

Noone et al (2010) observed 165 check-ins at a 399 room full-service city centre hotel and were concerned with conformance with a standard procedure rather than process duration. None of the observed check-ins completed all steps in the standard procedure. No guests were asked about pillow preference or offered enrolment in the loyalty scheme. Generally only those steps, for which staff could be held accountable, such as swiping a credit card, were completed on most occasions. As observed in Birmingham hotels, staff cut steps when check-in queues were long, supporting Noone et al (2010) who suggested that queues were a main reason for cutting steps.

If an activity does not add value for the customer and is not required by the system it can be classified as waste (Ohno, 1988). Assessment of customer satisfaction can be regarded as a judgement of value. Noone et al (2010) assessed the satisfaction of customers with different elements of the process. Information exchanged in the preferences stage included room type, pillow type, newspaper and smoking preference. The lasting impression group included offering luggage assistance, using the guest's name, smiling, maintaining eye contact, thank for choosing the hotel and wishing a pleasant stay (Noone et al, 2010). The steps that seemed to have no effect on satisfaction are mainly the necessary transactional steps of check-in. Displaying behaviours that communicate to the guests that they are welcome and valued appear to contribute to feelings of satisfaction. Employees appear to be aware of this indicating an empathy with customers and an understanding of what really matters to them: all observed hotels completed the essential steps and the 'lasting impression' actions. Appropriate throughput time therefore includes essential procedural activities and activities that have a positive impact on customer satisfaction, but excludes activities that don't add value for the customer. Standard operating procedures can be revised to reflect this and perhaps alternative ways of communicating additional information explored.

Table 5.14 shows short-term in-service actions taken to cope with demand peaks during service. The key tactics were to ensure that all check-in points were staffed and the check-in process was restricted to essential actions. In hotel B a staff member also went into the queue to identify queries that did not require the use of the front desk system.

Action	Evidence
Let queues form or control entry to the system.	• Front desk customers organised their own queuing system, they can see when servers are occupied. • Restaurant used ‘please wait here to be seated’ sign, so staff can note entry to the system.
Allocate more labour and equipment if available.	• Staff taken off back-office jobs. • Staff brought in from other departments. • Table settings borrowed from another department.
Prioritise to focus on customers present.	• Tables initially not cleaned and reset. • Initially neglect buffet re-stock. • Telephones unanswered. • Store up administration tasks for later.
Allocate task specialisations to organise work and avoid duplication.	• Greet and seat. • Split restaurant into stations. • Table busser (clears and resets tables). • Deal with enquires in the queue that don’t need the check-in terminal.
Shorten the encounter and reduce the number of steps or encounters.	• Reduced conversation with guests. • Fewer check-back visits to tables. • Encourage food order on seating guest at table. • Let group guests seat themselves. • Leave out non-essential check-in steps. • Work at faster pace. • Respond to a guest request rather than offering the normal range of services. • Generally reactive rather than proactive response to service provision.

Table 5.14: Observed in-service actions to cope with increased demand.

Service is created in response to demand and in the presence of the customer so employees must also have the authority and capability to be responsive to the varying levels of demand and the varying personal needs of customers as they perceive them during service.

5.5.2.1: Increase pace

Hotels are different from other services and hospitality generally, they need to make guests feel important, valued and welcome and create a feeling of a home away from home (Crick and Spencer, 2011), remember customers also need to feel in control (Namasivayam and Mount, 2006). This cannot be achieved by forcing the pace of customers. While working in industry the researcher experienced many late nights waiting for guests to leave the bar and go to bed. As in many situations, the duration and pace of service is set by the customer who consumes at the slowest pace. Customers assess their satisfaction with services - satisfying customers consistently can be a source of differentiation and an essential ingredient for success (Kandampully, 2006).

Research into customer satisfaction with meal duration indicates that customers may choose to linger and be in control of departure time (Hensley and Sulek, 2007). Reducing dining time may change the nature of the experience, but speeding up activities may result in customers feeling rushed which can impact adversely on satisfaction (Noone et al, 2007). Self-service allows customers to select a pace that suits their needs. Providing sufficient facilities, materials and equipment allows customers control of duration.

One of the tactics mentioned in table 5.10 suggests that more customers can be served by working faster. Noone et al (2009) indicate that both slow pace and fast pace can be detrimental to customer satisfaction when delivering hedonic services. This is further evidence that actions to improve throughput time should focus on what is appropriate from the customer's viewpoint. This can best be decided by leaving the customer in control of the pace and duration of the activities that deliver value to them. To some extent this relies on the ability of front line staff to recognise behavioural signals from customers that indicate they are ready to move to the next activity.

5.5.2.2: Organising Labour

The service encounter is the period of time in which customers directly occupy employees. Table 5.10 suggests principles for process design that can be used to reduce their duration. Table 5.15 lists the comments made by staff about actions that they take to speed processes. Note that comments apply to various topics in this chapter.

Speeds	
Pre-service	
Front Desk:	
Anticipation of arrival times for customers (A)	Planning for demand
Concierges are being cross-trained so that they can go and help receptionists if they are busy and he is not (A)	Flexible labour
Breakfast:	
Make clear everyone's duty (A)	Organising
Allocate different sections and different responsibilities when busy (D)	Organising
Perhaps if there were one person seating and greeting (C)	Organising
The sausages, black pudding and tomatoes are cooked at 6.00am. Everything else is cooked to order (C)	Pre-service task
Mise en place (all) Preparation of place settings to speed table resetting	Pre-service task
In-service	
Front Desk:	
We have express check-in for regular guests, also groups (A)	Simplification
If it is very busy we try to shorten the chit-chat (B)	Duration shortening
We cut the chit chat. (D)	Duration shortening

The detail asked for at check-in can be shortened (B)	Remove non-value-adding tasks
We pre-register groups (D)	Pre-service task
It is a brand standard to have a designated terminal. Priority Club members will see the signage to jump the queue (A)	Organising
If there is a queue sometimes I walk through and ask why they are queuing, for example, just for a key to the health club (B)	Organising
In theory a duty manager should be available to help out (D)	Flexible labour
Breakfast:	
At the weekend the menus are not put out and tinned fruit is put on the buffet in place of the cut fresh fruit (A)	Simplification
In free time we do mise-en-place, polishing glass or cutlery (B)	Pre-service task to avoid idle time
Could start earlier or finish later, if breakfast goes on later then people just get up later (A)	Organising
When a strong team is working there is not a problem (C)	
If colleagues are busy we will help on their station (B)	Organising
Everyone helps each other (A)	
Help each other, ask to help guest if they appear lost (A)	Organising
It is about setting priorities, keep an eye on each other's sections, team work (B)	Organising
It is all about how you organise your job (like mise-en-place), thinking ahead, not wasting time (B)	Organising
Just staff, they need to be quick on breakfast (C)	Organising
Looking after the restaurant as a whole is important, checking on whether tables need splitting (from 4 to 2x2) (B)	Organising
I do try to balance the load between sections (B)	Organising
Staff in sections, tea and coffee orders for your section only speeds (B)	Organising
Closer supervision of some staff needed (B)	Organising
Service speed depends on what customers order, some items take longer to cook than others (C)	Variable duration
Room service is only continental breakfast (C)	Limit service
Easier to do hot food as a buffet (D)	Customers work
Electronic ordering in China (D)	Speeding process
Put orders in Micros (A)	Speeding process
Post-service	
Front Desk:	
Update personal details on the computer system (all)	Post-service task
File signed registration forms (all)	Post-service task
Breakfast:	
Use of mise en place	Post-service task

Table 5.15: Reported and observed system actions that speed throughput at different stages of the check-in and breakfast processes.

The effect of employees on throughput time is due to much more than task competence. People are a reflective resource with the power to predict the likely effect of changes in behaviour on the outcome of a situation. The observations and interviews reveal that the division and distribution of activities among employees has an effect on throughput time (see table 5.15). The achievement of objectives relies on the division of work. Supervisors are in the front line of ensuring that work gets done as management requires (Mullins, 1998; Evans, 1999). Employees need to be able to monitor the demands on the system and take immediate action to adjust resources or processes, "to be responsive by ensuring that the necessary rules of order within an organization do not interfere with the performance of a task which the customer requires" (Riley, 1996:171).

Ineffective task allocation or execution can result in task repetition, a task repeated is waste. At one time in hotel D, when the restaurant was quite busy, the role of allocating tables was assigned to one person, at one point he lost track and assigned a table to an arriving guest while the guest previously assigned the table was visiting the buffet. On another occasion a table was approached twice for a food order. These situations can be avoided by making changes on the table as signals for occupancy or activity completion. Hotel A turned over cups when a decision had been made about beverage ordering, in hotel C menus were removed after hot food was offered or an order taken. Other signs experienced include shaking the napkin into the guest's lap to indicate occupancy or turning the menu upside down. The lack of the comprehensive use of signals is an indication that either the knowledge of supervisors is incomplete or staff can manage without the need for signals.

Employees need to be responsive, another term for having the authority to be responsive to customer requirements is 'empowered' (Riley, 1996). Although Gazzoli et al (2010) found that empowerment does not have a direct effect on the perception of service quality it is clear that, in the processes observed, if staff did not demonstrate responsiveness and reliability then delays in throughput time may have impacted on perceived service quality. Perhaps customers do not always perceive empowerment or the effect that it has. According to Ro and Chen (2011) empowerment involves bending the rules to please customers and providing a fast response to customer requests and service failures. Kildas (2007) adds that this is particular important in luxury hotels where the expectations of customers are higher. Changes to service delivery were observed that indicate front-line staff either take the power or are empowered to alter service to suit the situation. In hotel A the breakfast supervisor appeared to be selective when it came to showing guests to tables or checking their room numbers. In hotel B front desk staff were observed to shorten the check-in process when customers were waiting. Hotel C took no copies of overseas guest's passports while the observation of this legal requirement appeared to be applied patchily in all other observed hotels. Discretion to make decisions on resource usage is an important power in situations where service is created and consumed simultaneously but discussion of it in any detail is beyond the brief of this thesis.

It appeared that arrivals were monitored and in-service action was taken to respond to the arrival rate. On most occasions arrivals were required to wait at the entry point to the process. Asking customers to wait on service entry aids speed of service by ensuring that employees are aware that a new customer has arrived and requires service. Some customers waited at the restaurant entrance even when no notice was present while a few ignored the notice. The main exception to this was when hotel A was occupied by athletic teams when self-seating achieved the appropriate goal of maximising seat occupancy. Another purpose of greeting and seating guests is to establish the expected party size and allocate a table of a suitable size. If parties occupy tables with more seats than they need then capacity is left unoccupied while guests may need to wait for a table, waiting extends throughput time.

One more reason for the ‘greet and seat’ model in restaurants is to distribute the service load among stations. Frequently employees are assigned a section of the restaurant to look after. Spreading the load among sections aids throughput time. If employees have too many tables to look after they may lose track of who has been served or may leave tables waiting for service.

5.5.2.3: Vary labour volume in response to demand

There are limits to the extent to which tasks can be given to customers, steps cut from processes or work pace increased, sometimes the volume of labour needs to vary. Labour has the capacity to produce and absent labour can be seen as a leakage of capacity (Armistead & Clark, 1995). A common response to demand variability is to employ staff on a part-time and casual basis (Pullman and Rodgers, 2009). Although the question was not asked it was discovered that many non-supervisory staff are students employed on a ‘zero hours’ contract, meaning that they are not guaranteed any hours but are brought in as required. Having labour that is capable of fulfilling more than one role enables organisations to move labour around to where it is needed most. It can also mean that some labour can experience multiple requests for its services. Examples of this include the receptionist called away to serve at the bar (hotel B), the receptionist called to find items for a guest (iron and toothbrush in hotel D), the need to be a luggage porter and receptionist (all hotels), the need to serve in the restaurant and respond to room service requests (all hotels). Hotel B reported that staff had been brought into the restaurant from other departments to help with breakfast. This was also observed in hotel D. In hotel D it was noted that management are supposed to come and support reception as needed. Hotels A and C were cross-training the concierge to help with check-in. The knowledge and skill requirements of front office tasks means that there is a lot to learn before an employee can be deemed competent, in contrast little knowledge or skill is required to serve breakfast, perhaps because of this only management were observed helping at the front desk.

There is some debate over the difference in meaning between competence and capability (Slack and Lewis, 2011) and the words are sometimes used interchangeably. Capability can be a description of the necessary competences required to complete the activities of the job (Lawson in Fleetwood and Ackroyd, 2004). Work is the application of knowledge, only some of this knowledge is acquired in training. Knowledge develops through the experience of doing the task (Polanyi, 1962). It can therefore be expected that less experienced staff will take longer to complete activities or may not have the confidence to ‘crash’ the task.

A vivid example of this was noted in hotel C where bedrooms have names and not numbers, and traditional keys are used rather than key cards. One receptionist had only been a short time in the post and took a noticeable amount of time to locate the requested bedroom key while the experienced receptionist knew immediately where the key could be located. In hotel A it was noted that the observed receptionist followed the standard procedure for check-in on most occasions, while in hotels B and C it was noted that the steps followed varied depending on the number of guests waiting and whether the guest was recognised as a repeat customer. Chapman and Lovell (2006) argue that the hospitality service encounter is often in the hands of poorly trained front-line employees and inexperienced supervisors. Breakfast staff in hotel A reported that the supervisor did not have time to train staff. The front desk offers more opportunities for on the job training. Lulls in service were used in hotels C and D to train novice employees. Chapman's assertion must be taken as a generalisation, restaurant supervisors in hotels A and D had been in the posts for at least 10 years, while the front office supervisor in hotel C had been in the post for four years.

5.5.3: Capital: The role of facilities and equipment

Facilities and equipment represent capital and are part of the physical capacity. Customers come to the facility and it is a site for production and consumption. This section identifies the key properties of facilities and equipment that affect throughput time. Facilities and equipment are created by combining and shaping physical entities to achieve stated objectives (Stipanuk, 2006). Equipment is a tool, and knowledge is embedded in the functionality of the tool (Polanyi, 1962). One of the considerations in the shaping of tools is their utility in reducing the amount of effort required: generally animals regard effort as a cost. Reduced effort often means reduced activity time.

The size of spaces and the amount of space that each flow unit (customer) needs fixes the maximum capacity volume at a point in time. Hotels advertise different maximum function room occupancies based on different setups, the equipment occupies space that could be occupied by customers. Ohno's (1988) sources of waste include the time consuming wastes of movement and transport, these are directly attributable to the proximity of related functions and the layout of equipment.

5.5.3.1: Facility size and placement of functional spaces.

The size of physical facilities and the placement of activities in relation to each other can have an impact on throughput time. Physical capacity in the form of internal space is fixed in the short and medium term (Wild, 2002; Pullman and Rogers, 2009). Physical capacity can have some flexibility by having partitioned or adjoining spaces that can be pressed into service in response to forecast demand Transport is a waste (Ohno, 1988), having to carry items over a distance is non-value-adding time.

Hotels are often in old buildings (such as hotel D) or in buildings adapted from other uses (such as hotel C). Facility design decisions may have been made at a time when service methods or expectations were different. In hotel C the kitchen was located approximated 30 meters from the restaurant. In hotels A, B and D the buffets were placed close to the kitchen to reduce the travelling distance of staff. Travelling distance of the customer does not appear to have been taken into account. The restaurant supervisor in hotel D commented that a hot self-service buffet was desirable but that it would take away space needed for tables. Space is required to allow guests time to consume at their chosen pace. Decisions about the service method are therefore influenced by the requirement to balance the spatial needs of the customer and those of the operation. Operational performance may also be compromised by the design of the building.

The number of tables and covers that can be fitted into the breakfast restaurant limit the number of customers that can be served at any one time. Table 5.1, however, showed little commonality in the relationship between the number of bedrooms and the size of the restaurant. The impossibility of predicting arrival times, party size and dining duration must mean that the required room to table ratio to avoid queuing can hardly be known. Where demand is known capacity is not designed to accommodate all high demand periods (Dickson et al, 2005). Occasional waiting and degradation of service is therefore inevitable.

Check-in requires sufficient physical space for customers to gather. The presence, layout and speed of equipment plays a significant role in throughput time. Breakfast, however, does not have to be delivered in the restaurant and check-in does not have to take place at the front desk. Room service absorbs labour capacity but serves breakfast in a different location. Varying the service method, for example 'grab 'n' go', may also tempt some customers to change their consumption location. The nature of check-in and advances in technology mean that check-in can take place before arrival at the hotel. Operators can, therefore, consider reducing the load on limited capacity by moving the delivery of the service to a different location. This can involve a change to the nature of the service and, to be attractive to customers, the change must deliver them sufficient benefit.

5.5.3.2: Equipment presence, layout and speed

The role of technology in self-service was discussed in an earlier section. The term equipment is used here to mean all of the reusable items that support service creation and delivery; it includes furniture, service equipment, tableware and machinery. Equipment needs to be sufficient and in a usable condition, it forms part of the physical capacity. The speed with which machines can complete a task can also impact on the throughput rate. The role of maintenance will be discussed in a later section.

Staff in some hotels reported that insufficient glassware, crockery and cutlery required staff to occasionally spend time washing-up instead of serving customers. Crockery and glassware are fragile, cutlery sometimes gets dropped in the waste bin as plates are scraped. Interviews in hotel A indicated that management were slow to make-up shortfalls. Table 5.16 shows the comments made at interviews regarding the role of equipment in speeding or slowing throughput.

Speeds	Slows or delays
<u>Front Desk</u> Regular guests are quicker to check-in as have all the details on the system (D)	<u>Front Desk</u> We have only three front desk computers working (B) The key card issue (frequent calls to the desk with non-functioning key cards) is being dealt with, we are testing a new one and will phase it in (B) Sometimes there are computer failures (D) Computers (C)
<u>Breakfast</u> We used to use linen napkins but now use paper ones to cut costs (A) We have an extra buffet station sometimes when numbers a really big (A)	<u>Breakfast</u> Buffet table length (breads and pastries) there is only one toaster (A) Short of equipment (A) Shortage of staff, crockery and cutlery. There are breakages and cutlery disappears, probably going into the bins as plates are scraped (A)

Table 5.16: Comments about equipment that relate to speeding and slowing throughput.

The layout of a facility can have an impact on throughput time. At breakfast customers make individual food choices, generally hotels had arranged the food counters in lines against the restaurant wall. This makes most customers feel that they have to join the start of a line even if they do not want the food items at the start of the line. Zijlstra and Mobach (2011) investigated the influence of canteen layout on operations. Service time was improved when free-standing islands in a central location were used for food display. The central location resulted in a short travel time for users. The absence of a straight line layout allowed customers to move freely among the displays without customers feeling that others were queue jumping and delaying their progress.

At check-in the customer stands in one place while the service is delivered. The customer needs to have space in which they can wait their turn. Each check-in station was equipped with all the materials and equipment necessary (but not always working properly) to check a guest into the hotel minimising the need for staff to waste time moving around or transporting items.

All observed hotels provided cold buffets, hotels A and B also provided hot buffets. In hotel A the buffets were lined against the wall on one side of the restaurant, but divided into three hot and cold sections. Short queues were observed at each section. Hotel B had a similar arrangement at one end of the restaurant. The cold buffet in hotel C was arranged just inside the restaurant entrance, in hotel D it was in an adjoining room. Queues for the cold buffet were not observed in hotel C, the buffet was unobservable in hotel D. Clearly self-service time could be reduced in hotels A and B if the food service buffets were rearranged as suggested in the study by Zijlstra and Mobach.

Equipment can sometimes process at higher speeds or volumes and make fewer errors than people. Machines can be designed or programmed to contain knowledge as instructions that either complete the task or guide the operator through all the necessary steps. Computers are very good at storing vast amounts of information, working quickly to find it and repeatedly following procedures without error (O'Connor, 2000). Information about guests and their reservations can be quickly passed between machines without the risk of errors due to rekeying or lost pieces of paper. The check-in process presents screens laid out in a logical order to guide employees through the check-in process. Information technology can contribute to productivity and enhance the experience for the guest (Bilgihan et al, 2011). Kitchen equipment innovations proceed at a slower rate, however, some equipment cooks more quickly and more dependably (Rodgers, 2007).

In summary, facilities and equipment provide the space and tools to deliver service to customers. Sufficiency of space and a layout that minimises transport, movement and waiting impacts on throughput time. Equipment needs to be sufficient for the expected number of customers and functioning. Equipment can also speed throughput and reduce the likelihood of errors.

5.6: SUPPORTING THE FRONT-LINE

It is the front-line staff that create the product or service with the customer; they are the organisation as far as the customer is concerned. While the focus of this thesis is on operational processes it is felt that it is necessary to say a few words about key activities that can support throughput time. One role of management is to support front-line staff (Ohno, 1988). Various activities support front-line staff by providing:

- An environment in which they are trained, empowered and motivated,
- Information that helps them plan service and,
- Preventative maintenance practices that ensure equipment functions as it is supposed to.

Employees need to give instant responses to customers if speed of service is to be attained. The role of empowerment was discussed in an earlier section. This section briefly considers the management style and organisational culture that supports empowerment. In response to forecast demand hotels vary the resources deployed. Equipment that is broken, error prone or does not function as designed represents a capacity leakage that could lead to bottlenecks or delays.

5.6.1: Management style

The opinion has been expressed that hotels have features that make them a little bit different from hospitality, which in turn is different from many other services (Crick and Spencer, 2010). Seddon (2005) criticises the 'command and control' culture of many services that leads to a top down approach. He uses his extensive experience as a business consultant to champion the reorientation of process design to a focus on the needs of the customer. This is supported by the influential reconceptualization of marketing from a goods dominated to a service dominated logic (Vargo and Lusch, 2004, 2006). Bitner (1992) developed the servicescape model highlighting the impact of the physical environment on the emotions of employees and customers. Pine and Gilmore (1999) popularised the idea that consumers valued experiences. Parasuraman et al (1985) identified responsiveness and empathy as two of the five determinants of service quality.

The key point here is that the hospitality industry has been around a very long time, it emerged from the human need to gather in social groups. Successful hospitality operations have always been customer-focussed, designed to satisfy functional and emotional needs of customers. It is the culture of being hospitable; a culture that always puts the guest first (within certain limits) that permeates successful operations. This requires some devolvement of decision making to the front line. It requires managers as supporters of the front line staff, ensuring that they have the knowledge, ability and equipment to be responsive to customer need. Ro and Chen (2011) suggest that it is important to hire customer-focused employees. The organisation can support them through training, rewards and the communication of service standards. Kildas et al (2007) add the need for a customer-orientated non-blame organisational culture and a supportive management style. Employees need to be praised for showing initiative and mistakes should be viewed as learning opportunities.

5.6.2: Equipment Reliability

Equipment is an element of capacity. Faulty or inoperative equipment represents a leakage or reduction in capacity and can either cause errors requiring activities to be repeated or lead bottlenecks and delays in service. Chan et al (2001) noted that equipment failure in hotels can lead to a degradation of performance. Clearly procedures for preventing equipment failures can have an impact on performance generally (Stipanuk, 2006) and throughput time.

Hotels A, B and D issued key cards for access to rooms, on a number of occasions it was noted that guests were forced to return to the front desk because their key had stopped working. This fault was particularly noticeable in hotel B and they were taking steps to address it. Hotels B and D also had one front desk work station out of order. Equipment out of order can lead to a situation where there are sufficient staff to serve customers but insufficient equipment. Staff queuing to use equipment is a waste. Problems with key cutting machines were noted in hotels B and D, in hotel B staff on one check-in desk had to walk into the back office to cut the key card. For a time in hotel D only one key cutter was working meaning that guests could be checked-in on only one work station.

5.6.3: Demand Management and Demand Forecasting

It was observed that customers selected their own arrival time for check-in and breakfast. Group arrivals are encouraged to give an estimated time of arrival so that resources can be in place to cope with the volume. It is also common for in-house groups to reserve a time for breakfast for the same reason. Customers are heterogeneous and demand is lumpy, to improve the accuracy of forecasts more information is required about customer characteristics. It takes time and money to collect information and a trade-off needs to be made between the cost of collecting information and the accuracy of the forecast (Kalchschmidt et al, 2006).

Forecasting is mainly used to ensure that sufficient resources are in place to meet the expected level of demand. It was noted earlier that although the number of arrivals is known, the number that will arrive at any particular time is not. Operations generally do not provide sufficient resources to meet expected peak demand. Dickson et al (2005) claim that hospitality and service organisations set their capacity level at between 60% and 80% of expected demand, meaning that on 40%-20% of occasions capacity will be insufficient to provide an appropriate level of service. Table 5.1 shows the relationship between the number of rooms, tables and covers in each hotel. Although the number of rooms is given it is assumed that in most modern hotels all rooms have the capacity to sleep at least two people. Capacity planning is a strategic decision (Pullman and Rodgers, 2009). This thesis is concerned more with short-term capacity management tactics.

Demand forecasting helps with resource allocation and can be used in the restaurant where breakfast numbers can be known in advance. The arrival time of guests in both processes is unknown, at breakfast party size and the food item demand is also unknown. If guests are not to be subject to significant delays then there must be flexible or spare capacity to absorb demand as it occurs and brief service encounter times so that staff can process more customers with minimal delay to any one customer. Flexible table design, where two tops dominate and can be easily combined, gives flexibility to accommodate party size without splitting or keeping parties waiting (Kimes, 2004). This could also be said to have implications for the way in which guests are seated, 'how many in your party' is asked at seating, ones and twos need to be placed where they don't prevent the possibility of combining neighbouring tables should a larger party arrive.

5.7: SUMMARY

Both processes experience high variability in arrival and processing times. They display most of the features expected by Schmenner (1986, 2004), Slack et al (2009) and Johnston (2012). Only relative rather than exact positioning of an operation on these categorisation models is possible. Customer variability was classified using Frei's (2006) classification, generally request variety was a feature of the front desk and preference variety a feature of breakfast. System variability was looked at as capacity leakage and largely controllable.

At the front desk there is extensive request variety as well as variability in arrival times and process durations. Request variety is mainly information processing, this requires knowledgeable employees, labour is generally the rate-limiting resource. Process duration is generally short and intermittent so employees need other tasks to keep them occupied when customers are not demanding service. Generally the characteristics of front office define it more as a service shop with features of a professional service.

At breakfast the arrival times and table demand of customers is not known. Variability is also expressed in preference for different dishes and different consumption durations. The main rate limiting resource is space to put tables. Staff have little interaction with customers, customers mainly process themselves. Generally the characteristics of breakfast define it as a service shop with features of a mass service.

In both processes it was evident that principles had been applied to reduce the duration of service encounters. Care is taken not to hurry customers as this has been shown to affect satisfaction. Customers need to be largely in control of process duration and thus pass through the process at a pace appropriate for them. The key strategy is therefore variability accommodation. Self-service is used at breakfast to substitute for paid labour and accommodate variability. Although some front desk requests and some check-ins could be handled by customers the four star hotels visited did not seem to be encouraging customers to do more of the work.

To accommodate this variability and keep costs under control, capacity needs to vary. Labour is a controllable cost, flexible and part time labour can be used. In addition staff arrange their work so that they move from tasks that do not involve customers to service encounters as customer demand arises. At periods of high demand they have been seen to cut inessential steps from procedures to speed the service encounter. At breakfast space is the main limiting factor, if the design of the hotel permits it, hotels can expand the restaurant my making use of adjoining spaces. Breakfast service requires little technical skill so most employees can be pressed into service providing they are dressed appropriately.

The allocation of certain tasks to different members of staff was observed at breakfast. When the task is identifiable (e.g. seat, order, restock, clear) and demand sufficient, task specialisation improves flow. At the front desk request variety and task duration are less easy to predict and the most appropriate approach seems to be to have generalists who can deal with a wide variety of requests.

Responsiveness is enhanced by devolving some decision making powers to the front line. This needs to be supported by a suitable management style and a culture of putting the needs of customers first. To ensure that labour and materials are present when required an attempt must be made to forecast demand for products and services by market segment. The facilities and equipment need support in the form of maintenance to ensure that the planned physical capacity is maintained.

CHAPTER 6: CONCLUDING SECTION

The concluding section will review the extent to which the aim and objectives of the research have been achieved and will offer some reflections on the process, the contribution to knowledge and suggestions for future research. This thesis has been prepared as part of a Doctorate in Business Administration. According to The Association of Business Schools (2005) the DBA is a professional doctorate and should not only make a contribution to knowledge but also inform and impact on practice. This section therefore considers contribution to practice as well as contribution to theory. Data and theories in this thesis are already being passed onto future hospitality managers through lectures delivered by the researcher.

This fresh view of the causes and treatments for variability makes a small contribution to the vast output of operations management knowledge. It has taken up Klassen and Menor's (2007) challenge to increase understanding of process management fundamentals through the investigation of the relationship between capacity utilisation, variability and inventory (CVI). This research has presented "means to either attenuate or accommodate CVI trade-offs" (Klassen and Menor, 2007: 1031) and advanced understanding of process management. It has explored hotel operations, an under-researched area and used observation, an under-used research method.

6.1: MAIN CONTRIBUTION OF THE THESIS TO PRACTICE

This thesis has drawn attention to the uncontrollable level of customer variability in some service operations. Services that need to satisfy customers must consider, therefore, how they can accommodate variability and remain efficient.

The Process Management Triangle provides a simple illustration of the link between variability, capacity utilisation and inventory. The basic management principle is that, if variability is uncontrollable and a steady flow of customers needs to be maintained then operators need to think about manipulating capacity. Capacity consists mainly of physical facilities and equipment, labour and activity time. In the short term physical facilities and equipment are largely fixed and invariable. The main elements of capacity that can be manipulated by operations managers are labour and time.

This thesis distils principles from theory and practice that can be applied to efficiently configure resources and processes (capacity) so that customers can flow through the operation at a speed appropriate for them.

Process consumes time and various principles can be applied to rearrange activities or eliminate those that do not add value. The figure at the close of the chapter discussing literature (figure 2.9) presents an overview of the causes of variability and the key principles to apply to process and resource design. These throughput time principles are developed further in table 5.10. A key focus needs to be on the activities that are part of the service encounter. If the number or duration of service encounters can be reduced then, essentially, the labour processing capacity is increased. A short encounter time also means a short wait time when the operation is busy. It also means that, if queues do form, then they will reduce quickly. This does not mean that labour is idle when customer numbers are lower, they can be occupied with tasks that do not require the physical presence of the customer.

6.1.1: Key Findings and conclusions: Breakfast Service

Guests arrived at breakfast without a reservation at a time that suited them. Once in the restaurant they occupied physical capacity and stayed for a duration of their choosing. While there may be a period during which arrivals peak, this and the spread of arrivals can vary from day to day. The total number of customers expected is neither a good indication of whether there will be a time when all tables are occupied nor of the number of staff required to cope with demand at any particular time during service. Arrival time is not a reliable indicator of how many tables will be occupied in, say, 25 minutes time because dwell duration is also highly variable.

People, unlike material objects, have a sense of personal space and are usually reluctant to share a table with someone that they do not know. The restaurant cannot know how many covers on each table will be occupied. There can be occasions where there are many empty seats in a restaurant but no spare tables. Thus predicted arrival numbers is not a good indicator of whether seating capacity is sufficient. The restaurant cannot predict the volume of different food items that will be requested or consumed. This has implications for staffing and food preparation if over or under supply is to be avoided.

The two greatest sources of customer variability at breakfast were arrival and preference variability. Preference variability was expressed in the consumption of customers' own time and required facilities and materials to accommodate it.

As a rough guide managers could assume that around three quarters of guests will spend between 15 and 40 minutes eating breakfast. Perhaps more usefully observations revealed that half of all guest occupied tables for less than 25 minutes and 90% of guests left within 45 minutes.

6.1.2: Key Findings and conclusions: Front Desk

Front desk clerks were required to respond to a wide range of queries and requests from hotel guests and visitors. When queuing was observed it was sometimes because one of the front desk clerks was responding to a query or request from a guest already checked-in. As a very approximate calculation, only around 20% of available front desk clerk hours between 4.00pm and 7pm were spent checking people in.

Over 75% of check-ins were completed in less than three and a half minutes and 90% of check-ins in less than five minutes, or approximately one standard deviation above the mean.

In general check-in is a process with a brief duration. However, twenty one of the observed check-ins of over four minutes were generally due to customer behaviour, mainly requests for additional information.

The time required for check-in varied with the information needs of the hotel and customers. Customers are not uniform, the amount of information and the number of tasks required to check them in varied with the nature of their reservation. Check-in is also a social exchange where understanding and agreement is negotiated before the customer becomes accepted as a guest. Guests varied in the amount of information they needed to help plan their stay, or in their need for general social interaction.

Table 5.3 uses Frei's (2006) categorisation to re-group the types of customer variability recorded at check-in and reported in tables 4.8 and 4.9. A key feature was the volume and variety of requests, each of which also required different amounts of time to complete. Findings indicate that the two greatest sources of customer variability at check-in were arrival and request variability. Request variability consumed employee time and thus required constant variations in the number of employees available to satisfy requests.

Some requests required staff to leave the front desk reducing the effective capacity. This included storing or retrieving luggage, taking luggage to a room, showing a guest to a room. Historically these activities may have been the responsibility of the concierge. In two of these hotels the concierge post had been abolished, in the other two it was being phased out and the concierge was cross-trained to work on the front desk.

6.1.3: Capacity: Coping with variability

The quantitative data and supporting observations indicate that guest arrival time and process duration for both processes display a high degree of variability. There was also great variation in the duration of breakfast and check-in. The coefficient for variation averaged 64% for check-in (3 out of four hotels) and 44% for breakfast. Whilst the check-in had a median duration of 2:30 minutes, median breakfast duration was 24:30 minutes.

Armistead and Clark (1995) discussed the idea of the coping zone and suggested that as capacity utilisation increases, variability can result in an exponential increase in waiting time. They indicated that the higher the coefficient of variation the sooner queues start to form and the longer waiting time becomes. This idea is demonstrated by Slack et al (2010) using throughput delay curves (see figures 2.8 and 4.8) and described as a crucial concept for managing throughput time by Suri (2010). If variability cannot be significantly controlled then, to avoid delays for customers, processing capacity must be sufficient to satisfy the demands placed on it. Increases in processing capacity are achieved by adding physical capacity in the form of labour, facilities or equipment, or by speeding throughput.

The focus needs to be on the rate limiting resource (Armistead & Clark, 1994), generally the service encounter at the front desk and physical capacity at breakfast. The general principles are to minimise activities that consume labour time and provide facilities, equipment and materials to allow customer to process themselves at a pace that suits them. Mostly, the hotels used spare and flexible labour to increase capacity to adapt to changes in demand.

Check-in requires sufficient physical space for customers to gather. The presence, layout and speed of equipment plays a significant role in throughput time. Breakfast, however, does not have to be delivered in the restaurant and check-in does not have to take place at the front desk. Room service absorbs labour capacity but serves breakfast in a different location. Varying the service method, for example 'grab 'n' go', may also tempt some customers to change their consumption location. The nature of check-in and advances in technology mean that check-in can take place before arrival at the hotel. Operators can, therefore, consider reducing the load on limited physical capacity by moving the delivery of the service to a different location.

Equipment needs to be sufficient and in a usable condition, it forms part of the physical capacity. The speed with which machines can complete a task can also impact on the throughput rate.

The layout of a facility can have an impact on throughput time. At breakfast customers make individual food choices, generally hotels had arranged the food counters in lines against the restaurant wall. This makes most customers feel that they have to join the start of a line even if they do not want the food items at the start of the line. Zijlstra and Mobach (2011) investigated the influence of canteen layout on operations. Service time was improved when free-standing islands in a central location were used for food display.

6.1.3.1: Moderating Factors

It is asserted that the customer-focussed nature of service, with the goal of effectiveness taking priority over the goal of efficiency, and the fact that service can only be created at the point of delivery and usually requires some contribution from the customer, means that resources and processes are best configured to accommodate customer variability.

There is some evidence that low-cost accommodation tactics (Frei, 2006) were also used. The frontline service staff in hotels who interact with customers and ensure their satisfaction have always been low-paid. Self-service is common nowadays at breakfast, indeed it may be the preferred option for most customers.

Social interaction and engagement in other activities have been shown to influence dwell duration. Time is perceived as well as measured and the passing of time may be noticed less by those engaged in activity (Maister, 1985). Generally guests sharing a table arrived at different times but left at the same time. Joining another person at a table to share a meal has social meaning and psychological effects (Nyberg and Olsen, 2010). Customers should be left to consume at a pace of their choosing.

Utilitarian goods are primarily instrumental and functional, but even these have an experiential dimension (Holbrook & Hirschman, 1982). Arrival at the hotel and check-in, for example, is a “critical moment of truth” and an opportunity to make a good first impression (Vallen & Vallen, 2009:288) even though it is mainly a functional activity, a necessary step to gain access to the hotel facilities. Encounters at the front desk were customised in response to customer capability and requests. On many occasions this required discussion and information exchange. Restaurant experiences purchased for pleasure can be viewed as hedonic rather than functional (Noone et al, 2008). People experience emotions and are attracted to situations that generate positive emotions. It is likely to be beneficial for operators to consider the emotional impact of activities that involve the customer and to reduce the frequency and duration of those that are unlikely to generate positive emotions.

One of the tactics mentioned in table **5.10** suggests that more customers can be served by working faster. Noone et al (2009) indicate that both slow pace and fast pace can be detrimental to customer satisfaction when delivering hedonic services. This is further evidence that actions to improve throughput time should focus on what is appropriate from the customer's viewpoint. This can best be decided by leaving the customer in control of the pace and duration of the activities that deliver value to them. To some extent this relies on the ability of front line staff to recognise behavioural signals from customers that indicate they are ready to move to the next activity.

At busy times non-essential steps can be reduced or eliminated but customers must always be in control of when the process ends. The breakfast process is largely open-ended. The hotel facilitates the customers' experience creation and leaves the customer to decide the pace and duration. Check-in is more like an administration task, a necessity rather than a pleasure. Being hospitable, making people feel welcome and valued is a core feature of the hospitality industry (Crick and Spencer, 2010). This requires the expression of empathy and responsiveness (Parasuraman et al, 1985) rather than limitation and control of customers.

It is important for customers that they perceive that they are in control (Namasivayam and Mount, 2006), that they have choices. The need for customer choice necessarily results in service demand variety and variable duration. Vigorous attempts to reduce customer requests or preferences may therefore result in them feeling a loss of choice and thus control.

6.1.4: Removing Time

Removing time from service encounters speeds customer throughput and increases processing capacity. Employee activity and the service encounter consume time; time is a cost to the organisation. The more time spent with each customer the fewer customers an employee can serve. A key to managing variable demand, therefore, is to reduce the amount of employee activity time per customer, especially the service encounter.

Observations indicate that hotels took action to reduce the number of activities and the duration of activities using the tactics in table **5.10**. Employees made further reductions when they perceived that customers were being required to wait for service. Customers were permitted to set their own pace at breakfast but were, occasionally, subtly discouraged from extending the check-in process.

Simplifying the process is about reducing the amount of knowledge and level of skill, making it more like a commodity process (see figures 5.1 and 5.2). Reducing the duration of activities is about finding a way to deliver the same outcome in less time. Each of these tactics may also involve waste identification and elimination. Simpler processes are also less prone to error and may be straight-forward enough to either give to customers or incorporate into equipment.

There are limits to the extent to which tasks can be given to customers, steps cut from processes or work pace increased, sometimes the volume of labour needs to vary. Labour has the capacity to produce and absent labour can be seen as a leakage of capacity (Armistead & Clark, 1995). A common response to demand variability is to employ staff on a part-time and casual basis (Pullman and Rodgers, 2009).

The effect of employees on throughput time is due to much more than task competence. The observations and interviews reveal that the division and distribution of activities among employees has an effect on throughput time (see table 5.15). The achievement of objectives relies on the division of work. Supervisors are in the front line of ensuring that work gets done as management requires (Mullins, 1998; Evans, 1999). Employees need to be able to monitor the demands on the system and take immediate action to adjust resources or processes, "to be responsive by ensuring that the necessary rules of order within an organization do not interfere with the performance of a task which the customer requires" (Riley, 1996:171), another term for having the authority to be responsive to customer requirements is 'empowered' (Riley, 1996).

6.2: MAIN CONTRIBUTION OF THE THESIS TO THEORY

The key contribution to theory is evidence from practice of how resources and processes in services in which the customer is a co-producer are being configured to accommodate variability in customer arrival times and process duration. The Process Management Triangle places a focus on the role of flexible and spare capacity in variability accommodation. Interaction frequency and duration is reduced, this both improves efficiency and the ability to accommodate variability. The drive for efficiency is moderated by the requirement to satisfy the emotional needs of customers for social interaction and control of service duration.

The world is interpreted, made sense of, by applying conceptualisations to perceptions. In this case conceptualisations were largely drawn from Operations and Process Management texts so, inevitably, perceptions were interpreted through that 'theory filter'. The key useful theories were; the Process Management Triangle (Klassen & Menor, 2007); Frei's (2006) categorisation of types of and treatments for customer variability; Schmenner's (1986, 2004) categorisation of services; Armistead and Clark's (1994) model of capacity management; Key levers for managing flows summarised in Anupindi et al (2012).

This thesis has added weight to the utility and validity of the theories applied here to analyse operations and processes. It has demonstrated that what hotels do in practice can be interpreted using these models. In addition, apart from arrival variability, it has highlighted the difficulty of categorising customer variability (Frei, 2006). Effort variability can be expressed as a request or a preference, often it is not clear whether a request is made due to a lack of capability or a lack of effort. The two basic choices are for the customer to do it themselves, or for them to request that someone else does it for them. From an operator's viewpoint it is the effect of the variability on demand for resources that is more important than the customer's reason for expressing that demand.

It has highlighted the utility of and commonalities between the models of Schmmener (1986, 2004), Slack et al (2009) and Johnston et al (2012) (figures 5.1 and 5.2) and suggests that individual processes within an organisation or industry sector may be categorised differently. The move towards features of a mass service can be seen as necessary to be both efficient and accommodate customer variability. These models highlight how the nature of the process, such as the degree of interaction and customisation demanded, dictate necessary features of resource and process configuration, such as self-service or employee delivery.

The literature review conducted an in-depth conceptualisation of the term 'process'. It suggested that operations management adopts a systems and process view of organisations and that everything is 'in process' (Rescher, 1996), it is just that some processes are very slow. In this view there is no stable and unchanging state. Processes are causal mechanisms consisting of objects with properties that are mainly expressed in relation to how they interact with the properties of objects around them.

Managers learn the properties of objects and retroduce the configuration of resources and the necessary controls from a view of a desired end state. Because of the complexity of most systems the events generated by the interaction of objects cannot always be precisely predicted or controlled. The uncertainty that this generates is called risk management. Managers are pragmatic and will adjust objects and controls so that the outcome is closer to what was envisioned. This pragmatic view of knowledge and causality is shared by Critical Realists (Sayer, 1992).

6.3: THE EXTENT TO WHICH THE AIM AND OBJECTIVES HAVE BEEN ACHIEVED

The overall aim of this thesis was to explore what theory says about how resources and processes can be configured to achieve appropriate throughput time or to quickly adapt to cope with short term increases in demand and to investigate the actual tactics used in hotels. This section will consider the extent to which the aim and objectives have been achieved.

The first research objective was as follows:

1. To explore literature to review appropriate research and theories about how resources and processes can be configured to:
    a. Achieve appropriate throughput, and
    b. Make short term changes to effective service capacity to cope with short term peaks in demand.

Concepts, such as ‘process’, ‘cause and effect’, and ‘knowledge’ were investigated in some depth in the hope of generating a shared conceptualisation. The argument can only progress successfully if all sides share a similar conception of reality.

With this in mind it can be added that there is no such thing as an objective view of the world, everyone is burdened with their standpoint and may struggle to interpret the world from a new or different perspective. The perspective adopted here was that of a systems view of the world as processes in which objects with properties cause events to take place. Man, as do other animals, attempts to identify, understand and harness causal relationships to achieve benefits. It is at the operational level of business that a concerted effort is made to shape objects and events so that they achieve some predetermined aim. The fundamental questions being asked here are 'what causes event duration?' and 'how can the objects within our influence be shaped to produce an appropriate event duration?' Appropriate is used loosely to mean that which is acceptable to the person who judges the success of the event, in this case the customer.

Operations management literature was explored to identify key theories that could be used to explain how resources and processes could be configured to achieve appropriate throughput time or adapt to short-term changes in demand. The process management triangle, based on Little's Law, formed the basis for a conceptualisation of what was meant by process, capacity and variability. Categories of system variability were common in operations texts. Frei (2006) categorised customer variability and, from her research, suggested approaches for accommodating or reducing it. A conceptual framework of suggested tactics to apply to process and resource design was presented.

The second objective was as follows:

2. To explore literature to identify preconditions to achieve the above. The objective is to suggest the necessary and contingent conditions that increase the likelihood that 1a & 1b will occur.

As part of the literature review and methodology it was proposed that operations are open systems and that the involvement of the customer as a co-creator introduces significant unpredictability into the system. While tendencies for events to occur and improved likelihood can be achieved by the configuration of processes and resources, actually very little can be said to be attributed to law-like necessities.

The ideas of Critical Realism are rooted in the pragmatism of Peirce as are some of the key management thinkers of the 20th century. Conceptualisation of knowledge, causation and reality from thinkers such as Sayer, Polyani, Archer, Fleetwood and Mingers has helped the researcher make sense of readings and findings and sits comfortably with the researcher's view of business knowledge more as the search for something practically adequate rather than a search for immutable laws.

Theories on process flow management (Anupindi et al, 2012) and the summary of research into capacity management (Pullman & Rodgers, 2009) provided the basis for a list of principles to apply to achieve appropriate throughput time. Armistead and Clark 's (1994) model of capacity management and concept of the coping zone helped conceptualise some sources of variability and methods of dealing with it. Capacity leakage is waste, the concept of waste from the lean paradigm helped the researcher identify additional factors affecting throughput time. The identification of necessary and contingent conditions has been limited.

Evidence has been presented about the actual and necessary properties of objects that impact on throughput time.

The third objective was as follows:

3. To select and investigate a number of mid-market, full-service hotels to identify the actual tactics used to achieve the above.

The extent of variability was observed and recorded. The steps of each process were recorded and activities that speeded or delayed throughput were identified.

The most surprising finding was the extent of variability in customer arrival and processing time which made in-service demands virtually unpredictable. Deviation from the mean was so great that the use of average duration times would be of no practical use. The inter-arrival time was just as unpredictable, making resource planning difficult. There was added complexity in the restaurant because it was not possible to predict how many seats on each table would be occupied at any time. Operations Management is closely linked with Operations Research and tends to assume that business systems can be modelled and simulated. This research revealed that, at least in some circumstances, customer behaviour is so unpredictable that it cannot be predicted or easily simulated; instead processes and resources need to be designed to cope with unpredictability. This requires short service encounter times combined with flexible resources and responsive cross-trained staff.

Hotels acknowledged that the customer is a co-producer in the process and needs to be permitted to express preferences and have their needs satisfied. Time limits on processes in which the customer is involved are inappropriate. Instead the hotels concentrate on improving their capacity to process by reducing their labour content, largely through shortening service encounters and giving more work to customers. Where possible, flexible labour and capacity is used to cope with short-term changes in demand. Lulls in demand are used as rest periods and for carrying out activities that do not require the presence of the customer.

The fourth objective was as follows:

4. To discuss the findings in relation to theory derived from previous research.

Most previous research into operations in hotels looks at meal service, only one article was found that focussed on performance at check-in. There was very little research into the causes of customer variability and its extent. Seddon (2005) and Frei (2006) supplied good insights into customer variability and approaches to managing it in services. Anupindi et al (2012), although mainly concerned with manufacturing, supplied a useful set of principles to apply to improve process flow. All these authors seemed to draw at least some inspiration from principles of Lean Manufacturing. The hotels were seen to be applying tactics for reducing process duration identified in literature.

Coping with variability can be considered a capacity management issue. However, capacity management literature is traditionally focused on variability reduction and maximising capacity utilisation. Smooth even flow and improved productivity are the aims. This mechanical view needs to be modified for customer-focused operations. Their long term success is more concerned with satisfying customers. This can mean embracing variability as a key feature of operations.

The hotels seem to be working to control and reduce variability that arises from the system. They were also trying to use flexible and spare capacity to accommodate variability with some degree of efficiency. Other key principles seen in action were simplification of the processes and giving more of the process activities to the customer.

The final objective was as follows:

5. To conclude and make recommendations for appropriate resource configurations to apply that are likely to lead to appropriate speed of service.

This objective relates to this section of the thesis and is achieved in the previous sections.

6.4: WEAKNESSES OF THE THESIS

This is a good point at which to reflect upon the researcher's perceived weaknesses and fears. There are the, assumed, common ones of limited resources and time. There is only so much a lone researcher can achieve given personal and resource limitations. Also inevitably a person is trapped by their own limits of intellectual capacity and character. The researcher prefers to view his lack of genius as a positive advantage in that it requires him to express things in a way that may be more understandable to the majority!

There is always a nagging suspicion that a pertinent article has been overlooked. The sophistication of arguments can always be improved by adding references from additional reading. Perhaps some key finding has not been uncovered, or some important point in the analysis overlooked. Basically, this thesis could be developed for another year and still not be perfect.

There is always a reason to criticise the research design and to the generalizability or validity of the outcomes. These points have been addressed in the methodology. Yes, given more time perhaps another hotel or two could have been visited. Perhaps other processes, such as room servicing or kitchen breakfast service, could have been added as a contrasting process. Perhaps more and lengthier interviews would have revealed deeper insights into sources of system variability. Certainly if two observers had been available more table dwell time data could have been collected, or check-out could have been observed. The researcher is, however, satisfied that sufficient has been done to say that useful knowledge has been created.

6.5: RECOMMENDATIONS FOR FURTHER RESEARCH

Hospitality operations consist of processes with different features. Processes such as food production and housekeeping have perhaps more in common with manufacturing in that they are repetitive and the tangible output means that quality can be more objectively assessed. Different performance objectives will take prominence in hotels of different prices. There is therefore scope to investigate throughput time for other hospitality processes or process design in hotels with higher or lower quality ratings.

The focus has been on accommodating variability. There is scope to investigate ways to influence customer behaviour so that variability can be reduced without a perceived reduction in service quality. It is suspected that elements of the servicescape could be considered in combination with the psychology of consumers. Perhaps hospitality can learn something about influencing customer behaviour from supermarkets.

The researcher found that talking to employees and watching the process in action enabled the identification of causal explanations that could not be discovered by questionnaires or desk-bound research. Observation maybe time consuming but it is also rewarding. It is recommended that researchers give more consideration to discovering causes by watching rather than inferring them from the analysis of questionnaires and interviews.

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APPENDICES

APPENDIX 1: PROFORMA OF QUESTIONS

Interview questions

The questions below indicate the major questions to be asked, supplementary questions may be added to seek clarification.

Questions for all interviewees

- Can you give examples of things that you do that speed service or reduce waiting time for customers?
- Can you think of anything that slows down service, or causes delays or queues?
- Can you suggest of any changes to service or the service area that may speed up service?

Additional questions for servers and supervisor only

- Before / during service I noticed that you XXXXX, how does that help?

Additional questions for the departmental manager

- As arise in the context of each case

APPENDIX 2: EMAIL EXAMPLE OF RESEARCH AIMS AND DATA TO BE COLLECTED

Dear XXXXX

I have been a lecturer in hospitality operations management at University College Birmingham for eight years and am working towards a Doctorate at Birmingham University. I am collecting data on how customers and the service system influence the duration of the service encounter. I am focussing on check-in and breakfast service.

I would like to use your hotel as one of my case studies. I do not need to interview or question customers. The majority of the time would be spent sitting, observing service and taking notes on service duration, sources of duration variation and front desk task variety.

I have visited three four star hotels in Birmingham and plan to visit two more, the names of the hotels and staff will not be revealed in the final report, a copy of which will be sent to all participating hotels in late 2012.

Please allow me the opportunity of meeting with you to discuss the planned research procedures in detail, answer any questions that you may have and, hopefully, gain your commitment to this research. To give you an idea of the time frame, I am hoping to be permitted to conduct research in your hotel from Tuesday March 27th 2012.

Tuesday March 27th	Check-in
Wednesday	Breakfast & Check-in
Thursday	Breakfast & Check-in
Friday	Breakfast

Check-in would be observed from 4.00pm to approximately 7.30pm and breakfast service from the start until around 9.30am. Occasional questions may be asked of staff at during service if they are not busy serving customers. Formal interviews of no more than 15 minutes with approximately five staff would be conducted on the Thursday or at a convenient time during the following week.

Please email or telephone me so that we can arrange a mutually convenient time to meet so that I can answer any questions that you may have and hopefully persuade you to allow me access to your hotel. I have no teaching on Wednesday afternoons, Thursday afternoons and Friday mornings. I hope to hear from you soon, if I don't hear from you within a few days then I will send you a gentle reminder.

Regards,

XXXXXXXX

APPENDIX 3: EXAMPLE OF A BRIEFING SHEET

The broad question is – how far can we go in eliminating queues and waiting time?

The basic purpose is to explore and explain how the way you work and the facilities and equipment that you use helps or hinders the flow of customers. So as well as working practices it is about the physical facilities and equipment that are available.

There is a lot of research and theory from other industries but I am interested in the approach of hotels to the problem.

To help answer the question I need to watch you work and talk to you. There are a few questions that I would like you to think about. I will chat to you and other staff during the week to gather some answers:

- Can you give examples of things that you do that speed service or reduce waiting time for customers?
- Can you think of anything that slows down service, or causes delays or queues?
- Can you suggest of any changes to service or the service area that may speed up service?

I also need to look at any documents that you have that set standards for working or performance.

Most time will be spent sitting and observing. There may be occasions during service when I ask a question or two. The proposed schedule is below.

Tuesday	Check-in
Wednesday	Breakfast & Check-in
Thursday	Breakfast & Check-in
Friday	Possibly talk to staff
Saturday	
Sunday	Breakfast

I will observe reception from 4.00pm to 8.00pm. I am mainly concerned with check-in duration and what affects it, but I will also need to list the other tasks that occupy front desk staff. For two observations I will observe from the lobby area, I need to have one observation session from behind reception so that I can observe and hear what is being said.

I will observe breakfast service from start to finish, or for at least three hours. Ideally I will observe from a small table in the restaurant. I don't want to take tables away from customers so if all tables are occupied I will move to a location where I can observe and make notes without occupying a table.

Although I am observing service I will also be chatting to you about what you do to prepare for service. As I observe I may ask the occasional question to seek clarification about procedures or actions taken. I would like to talk to operations supervisors and managers and a few operations staff individually after I have spent some time observing. Perhaps after breakfast on Thursday I can have a team meeting with three servers and ask a few questions. I will arrange mutually suitable times to chat to the breakfast supervisor, the front office manager and the operations manager

APPENDIX 4: EXAMPLE OF A REPORT SENT TO A HOTEL

Analysis of findings (XXXX)

Managers are under pressure to meet financial targets. To do this they need to use their capacity to maximise revenue (usually by maximising capacity utilisation) and to control or reduce the input resources that create the costs. Capacity consists of volume and time. Capacity volume is made up of capital in the form of physical facilities and equipment and labour in the form of people and their capabilities. Work is activity and is often described as a process, activity takes time to complete, some activities require the customer to be present, others can be completed without the customer.

Maximum capacity is equal to the maximum throughput rate. Effective (available) capacity is set by the resource that limits the throughput rate (Armistead & Clarke, 1994). Effective capacity can be adjusted by changing the volume limiting capacity resource or the required duration of volume limiting activities. Activities that do not require the customer to be present can be completed pre-process (encounter) or post process (encounter). If demand is variable then there may be the opportunity to complete pre and post process tasks during periods of low demand, alternatively the task can be moved to back office and completed by a person not involved in the customer interaction (Anupindi et al, 2012).

Time variability in task completion is rooted in the system and the customer. Activities that consume more time also reduce effective processing capacity because more time is consumed per transaction. Reducing or accommodating variability can therefore either increase effective capacity or smooth the flow of customers through the system. This is important because reduced effective processing capacity can lead to delays or queues for customers or even lead to potential customers either leaving or being turned away. The potential result is for customer dissatisfaction and reduced revenue. Thus there is a causal relationship between variability, capacity utilisation and inventory (in the form of customers). If the goal is to control the level of inventory and ensure its unimpeded flow through the system then variability must be reduced or capacity designed and managed to absorb it (Klassen & Menor, 2006).

Two models will be used to categorise the sources of variability. Armistead and Clarke's (1994) model of capacity will be used to categorise observed sources of variation stemming largely from the resources and processes of the organisation. Observed short-term capacity management approaches will be plotted against the list compiled by Pullman & Rodgers (2009). Frei's (2006) sources of customer variability will be used to categorise observed customer variability. Observed customer arrival times and durations of service will be analysed. Commentary will highlight and analyse the main causes of variation in process duration and explain the extent to which the nature of the resources and activities of the two processes are arranged to achieve appropriate throughput time and quickly adapt to cope with short term changes in demand.

Two parts of Armistead & Clarke's model are used here, capacity task and service leakage (tables 1 and 2). Capacity tasks are tasks that help management balance supply and demand. The short-term capacity management strategies of Pullman and Rogers (table 3) are actions that can be categorised mainly as scheduling, controlling and coping tasks. These tasks can be viewed as responses to forecast demand or identified bottlenecks. Arranging to use flexible capacity assumes that demand forecasting has taken place and the ability of existing capacity to cope with demand assessed. Attempts to schedule or influence patterns of demand indicate an understanding of the limitations of capacity. The use of automation or customer participation indicates an understanding that labour bottlenecks can be treated by allowing customers and machines to be substitutes for labour.

Capacity task	Interpretation	Observed
Priority setting	Where there are conflicting demands from customers decisions need to be made about which customer is served first.	Priority given to customers present over table clearing. Priority given to customers present over telephone calls.
Bottleneck identification	Identify and treat the rate limiting resource.	Labour flexibility observed (events server brought in to help at breakfast), and priority setting was observed.
Forecasting demand	Forecasting customer demand so that only the necessary resources to meet demand are acquired and deployed.	Forecasting appeared to be largely based on an assumed guest numbers. The variety of tasks in front office means that the demand for labour cannot be forecast. In both cases the arrival pattern of customers is unpredictable.
Scheduling	Smoothing demand by scheduling it, taking restaurant reservations for example.	Demand for check-in and breakfast cannot be scheduled.
Coping strategies	Strategies to implement in services as available capacity becomes insufficient to meet demand in the time frame expected by customers, or when demand is insufficient to keep capacity utilised.	The number of staff working varied with demand. It was reported that specific tasks are allocated during busy breakfast service. Management are supposed to add labour capacity to the front desk at busy times. Customers are required to wait when capacity is occupied or unavailable.
Controlling capacity	Changing capacity in response to predicted and actual demand, i.e. having spare or flexible capacity.	Physical capacity seemed fixed, labour capacity was flexible. Clerks switched from pre / post process tasks and admin tasks to deal with customers present.

Table 1: Armistead & Clarke's capacity tasks at the XXXX.

Variation in service time due to the design or delivery of service was evident, table **Error! Reference source not found.** lists some sources in the capacity leakage section, details are given in the appendices. Priority setting strategies were observed to attempt to speed service for the customers. Labour underperformance is a very negative term and suggests that there are clear performance targets that employees are expected to achieve, for example a check-in duration or an upsell target. Differences in labour capability is a perhaps more appropriate term. The differences stem from different characters and length of experience and different knowledge and skills. Noone et al (2010) observed 165 check-ins at a hotel and observed frequent non-compliance with the Standard Operating Procedures. There was high compliance with steps for which staff could be held accountable, such as swiping a credit card. They also observed that the order of tasks varied, partly due to staff behaviour and partly due to customer involvement and preference.

Service Load		Observed
Service variety	The variety of tasks or activities that may be available, each of which may require different lengths of time to complete.	Front desk clerks were observed responding to a wide variety of requests each requiring different lengths of time. Breakfast items cooked to order were the main source of variety. A breakfast menu was presented but guests sometimes requested a slight variation from the dishes described.
Variation in demand	Lumpy arrival patterns leading to variations in capacity utilisation and possibly queues. Variation in customer behaviour as suggested by Frei (2006).	Arrivals were unscheduled and demand was lumpy in both processes. No queuing was observed at breakfast. Only brief queues at the front desk. Customers who wanted hot food were required to wait for it to be cooked.
Resource absorption per service	The nature of a service task or actions of the customer that result in varying time requirements for part or all of a process.	Front desk tasks varied greatly in the amount of time required and each required the presence of an employee throughout the process. The time required for a task varied. Breakfast service encounters were brief, physical capacity largely absorbed customer time variation. The length of time required to cook different menu items may have meant that customers were kept waiting different lengths of time.

Demand management	The effectiveness of any demand management strategies in matching demand with capacity.	No demand management strategies observed.
Capacity Leakage		
Labour lateness / absenteeism	Insufficient labour resulting in customers waiting.	No labour shortage observed, however on occasions front desk clerks were called away from the desk to do other tasks, leaving customers waiting briefly (either in person or on the phone).
Quality failures	Imprecise equipment, substandard materials or employee errors, perhaps due to lack of training or lack of standard operating procedures (SOPs).	No quality failures were observed at breakfast. No service failures were observed on the front desk. There were SOPs for check-in and training was evident and most staff appeared experienced. There were failures in maintenance and housekeeping that made demands on the time of front office staff.
Scheduling losses	Demand cannot be satisfied due to late delivery or shortage of materials, equipment shortages or breakdowns.	No scheduling losses were observed at breakfast. Demand from customers present was always satisfied
Labour underperformance	Varying knowledge, motivation or capability of the workforce.	No labour underperformance was observed at breakfast. Less experienced clerk appeared to take longer to complete guest requests and more often had to seek support.
Change-overs	Capacity unavailable while it is prepared for the next customer.	No physical change-over at the front desk. Physical capacity was limited. The need to reset tables did not cause any significant delays to service but may have limited their choice of where to sit.

Table 2: Sources of variability affecting capacity at the XXXX. Adapted from Armistead & Clarke (1994).

A wide variety of approaches to capacity management were reported by Pullman & Rodgers, (2009). Table 3 lists the approaches observed at the XXXX. Most capacity flexibility was delivered through labour flexibility, breakfast service also made some use of guests as a substitute for hotel labour.

Physical Capacity		Observed
	Physical Flexibility	Largely fixed, but additional restaurant space reported
	Rent capacity	Not relevant
	Share capacity	No
	Hire sub-contractors	No
	Change resource allocations	Not for physical capacity
	Change hours of operation	Demand met within time periods set
	Provide off-site access	Not relevant
	Use automation	No evidence
Price / Segment Flexibility		
	Partition visitors (status & length of transaction)	No partition on status or length of transaction observed.
	Yield management	Not relevant
	Revenue management	Not observed.
Human Capacity		
	Labour Flexibility	Staff could do a variety of tasks in each department. Staff from other departments could help serve breakfast or help at reception. Staff changed their tasks to concentrate on the customers present
	Schedule employees	Staff were mostly scheduled in response to predicted demand.
	Allow overtime	Not known
	Allow idle time	Allowed but more usually filled with pre and post process tasks or with necessary but

		not time bound tasks
	Cross-train employees	Managers cross-trained on reception
	Change work speed and process	No change in work speed or procedures observed
	Hire permanent employees	Evident
	Lay-off employees	Not known
	Use temporary employees	Not known
	Use part-time employees	A number of staff were part-time
Visitor Flexibility		
	Allow waiting	Waiting was allowed but was only rarely required.
	Allow balking	Allowed but not observed.
	Turn away visitors	Bedroom capacity is fixed so enquirers must be turned away if all rooms are occupied. Breakfast guests cannot be turned away (unless walk-ins).
	Provide rewards or incentives	No rewards or incentives used to influence arrival time for or volume of service consumption.
	Provide diversions or complementary services	Queues were short so this was not necessary. One guest sent to the bar when the system was down
	Camouflage the queue	Not relevant in this context
	Pay for VIP queues	No priority queues in place
	Change level of visitor participation	Cold breakfast items were self-service. There is no option for self-check-in
	Schedule visitors / take reservations	Not industry practice for breakfast Impractical for check-in.
	Inform / educate about alternative options	Breakfast room service available as an option No check-in alternative

Table 3: Short-term capacity management approaches (Pullman & Rodgers, 2009) observed at The XXXX.

In the two departments service encounters are generally brief, the servers interact with a large number of different customers during their shift. Servers are there to fulfil a need of the customer, there is an exchange of information and the server performs a task that allows the customer to fulfil the need that they seek to satisfy. While the number of customers due to arrive can be forecast, the actual time of their arrival cannot. These unscheduled, or random, arrivals mean that capacity experiences variable demand. At times capacity may be fully utilised and customers forced to queue or be turned away, at other times it may be under-utilised.

It is important to note a key feature of systems where events are random, i.e. not scheduled. While it may be possible to identify the total level of demand and the general pattern the exact arrival time of each customer cannot be predicted. Arrival times of customers (events) are not evenly distributed, such systems are characterised by more short inter-arrival times and fewer longer arrival times and generally conform to an exponential distribution, for example, customers arriving at an event. If customer waiting time is to be minimised then the system must be designed so that processing capacity can be quickly increased or decreased in response to customer demand, for example, the number of open check-outs in a supermarket. Queuing theory incorporates the assumption of an exponential distribution of customer inter-arrival times (Slack et al, 2010).

Basically, the more time that each customer interacts with staff the greater the number of staff required. To ensure that customers are not kept waiting the hotel needs to ensure that sufficient physical and labour capacity is available and that process duration that involves the customer (the service encounter) is controlled. To achieve a short service encounter only those tasks that have to be carried out with the customer present should be carried out with the customer present, other tasks should be moved to pre-encounter or post-encounter (Anupindi et al, 2012). A short service encounter enables servers to serve more customers in a given time period, this is particularly appropriate where demand is variable, during periods with few or no customers servers can carry out the pre and post encounter tasks. This was evident in both departments. At the front desk there was a great variety of tasks to complete and no way of predicting when demands for service from customers would arrive. A great deal of variety in the type of task and task duration was observed on the front desk, refer to appendix XX for a full list. The variety of tasks required of restaurant staff is more limited, when not interacting with customers servers cleared and reset tables, restocked mise-en-place and the cold buffet. Physical capacity provides the necessary space for customers to consume or act when not interacting with staff.

Customers often take part in the process as a co-producer and are perhaps the source of the greatest amount of time variability and the least controllable source. The five types of customer variability in service processes identified by Frei (2006) are considered in table 4. The two most frequently observed sources of customer variability were arrival and request variability. Arrival variability has already been discussed. There is no industry standard for the service variety offered and the willingness to be flexible or customise in response to customer requests, it is a policy choice for the hotel. Request variability can add to process time in two ways. Firstly, if it takes time to change over from delivering one service to another, for example, preparing a continental breakfast tray and delivering it. Secondly, the time demands (resource absorption) for a request vary, for example, some items take longer to cook than others, some customers request more server attention than others. If service variety and request variability result in variable demands on server time then sufficient labour capacity needs to be provided to absorb this variation, otherwise customers may have to wait.

The server can be removed from the process by requiring the customer to do some of the work. Breakfast is a consumption activity, servers are there to provide products for customer consumption. The contact time with customers is minimal and duration is in the control of customers. Physical capacity needs to be sufficient to absorb the variation in demand and duration patterns for most occasions. It is not economic to design physical capacity to cope with the infrequent high demand occasions (Dickson et al, 2005), for example, when everyone 'decides' to come down for breakfast at the same time. It must be accepted that, on some occasions at least, customers will have to wait.

The check-in process is more complex than breakfast service, there appears to be a security element (checking and confirming of identity), an information exchange and confirmation element (duration, room type and payment), an offer of services (newspaper, wake-up, dinner) and (sometimes) an information provision element (hotel services, and locations). The customer and server occupy physical capacity and remain together until the process is completed. Check-in is an information exchange in which the arriving customer is transformed into, and accepted as, a hotel guest by the provision of a room key, only time is consumed. The customer can influence the length of the service process by the speed with which responses are given and the number and complexity of additional questions asked.

Check-in duration can be reduced by removing all but the most necessary transactions and exchanges, the XXXX believes that it has achieved this. If customers had prior access to all the information about their reservation and the hotel they could complete (pre-process) all essential activities without the need for a server. Hotels that use electronic door locks are in a position to allow remote check-in, at least for regular or loyal customers. Information about guest services could be provided in the room. The decision to maintain a face-to-face check-in needs to be made on the basis of whether the organisation considers that the opportunity for social interaction adds value for the customer.

Guests arrive at breakfast, at a time that suits them. Arrivals gradually increased with the peak time being roughly between about 7.30am and 8.45am. They can then stay at the tables for as long as they choose and 'self-request' among the wide variety of food items. Although the average observed duration for breakfast was 26:33 minutes, the standard deviation was about 11 minutes. It is clear from figure **Error! Reference source not found.** that there was a wide variety in the observed dwell frequency. It was observed that customers were not only occupied with eating breakfast but carried out a variety of tasks such as, reading newspapers or mobile phones and chatting to colleagues or partners. Sufficient physical capacity is required to absorb the variation in dwell time so that customers are not kept waiting due to the unavailability of physical capacity. Where customers occupy physical capacity for a duration of their choice the amount of capacity available should reflect the volume and time demands placed on it. For more statistics please see appendix XX.

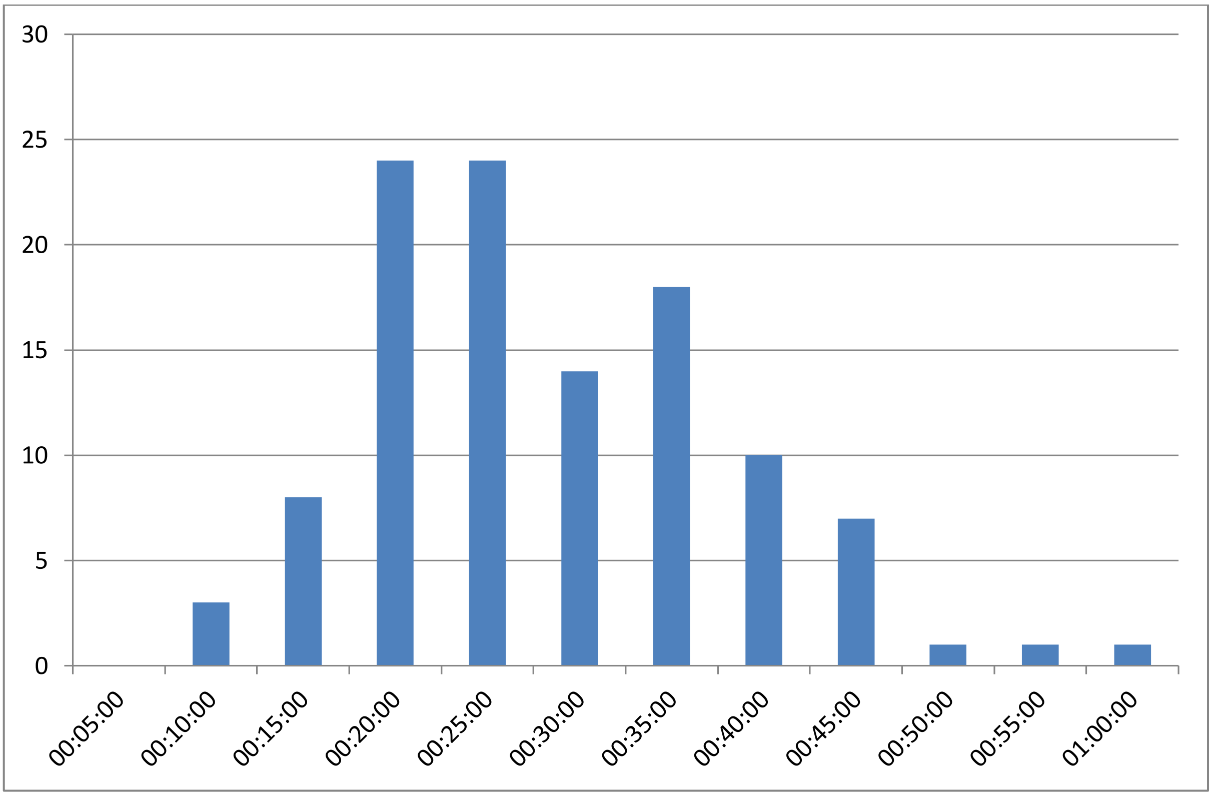

Figure 9. Recorded breakfast dwell time frequency

Customers arrive for check-in at a time that suits them and they influence the speed of check-in by the detail and speed of response to questions asked and the number and complexity of questions that they ask to servers.

Variability type	Description	Observed
Arrival variability	Arrivals may follow a pattern but guests arrive when in suits them.	Arrival times followed a rough pattern, the busiest breakfast period was between 7:40am and 8:40am. There was no observable pattern to arrival times of check-in customers, except that there seemed to be lots of short inter-arrival times. Guests arrived at both services at a time that suited them.
Request variability	Variation from the standard service or product and varying demand for the number of products or services.	The provision of a breakfast buffet with a variety of cold food options enabled guests to self-select items of their choice as frequently as they wished. Cooked food was offered, customisation of orders was permitted. Different dishes required different preparation times. A wide variety of requests were made at the front desk apart from check-in. Customers request variety appeared to be the main source of time variation in all front desk activities.
Capability variability	Abilities of customers vary with knowledge, skill or physical ability. This is particularly important where the customer is a co-producer.	Most customers had either stayed in hotels before or at this particular hotel and seemed be familiar with what was required of them. Customers appeared to understand the convention of waiting their turn for service and the need to wait for items to be cooked. Help with luggage was offered on occasions and, when there was a significant amount, accepted.
Effort variability	Different customers are willing to put in different amounts of effort as co-producers.	Not observed.
Subjective preference variability	Derives from a subjective opinion and valuation of the different elements of a service.	This was difficult to observe and perhaps was expressed in request variability. Customers who do not like the way service is delivered may not express this but may simply try a different hotel next time.

Table 4: Evidence of customer variability at the XXXX.

Front desk clerks are required to carry out a variety of tasks, the duration of all tasks, including check-in, was very variable. A key difference between the breakfast process and the front desk is that here customers occupy capacity for the duration of the service encounter, they do not require physical capacity to sit and consume. Another difference is the time service is available, breakfast service is limited to a four hour slot, generally hotels prefer guests not to check-in before 2.00pm, but after that time they can check-in at any time, thus demand for service is spread out over a longer time period.

The strategies used to cope with customer variability differed in each department. In table **Error! Reference source not found.** the observed strategies are highlighted in bold text. The predominant strategy was Classic Accommodation, this uses labour to accommodate the variability. Only breakfast service made some use of other strategies, this mainly took the form of self-service. Deciding which strategy to adopt is context dependent. The XXXX is an AA four star hotel and uses adjectives such as "luxurious", "comfortable", "delicious" and "glamorous" (XXXX accessed 03.04.12), in addition the company claims that "we're run by real hoteliers who have the genuine passion and the experience to make our service, dining and accommodation the very best it can be" (XXXX accessed 03.04.12). Reduction and low-cost strategies may be perceived by the customer as detracting from the level of service offered and thus the perception of the brand that the company is trying to maintain. Product and service options by their nature have limitations and thus there is always a limit to service breadth and some customers may be forced to limit their expectations to what can be provided. It is therefore not a question of which strategy is best but which best helps the operation achieve its objectives.

	Classic Accommodation	**Low-Cost Accommodation**	**Classic Reduction**	**Uncompromised Reduction**
Arrival	• **Make sure plenty of employees are on hand**	• Hire lower-cost labour • Automate tasks • Outsource customer contact • Create self-service options	• Require reservations • Provide off-peak pricing • Limit service availability	• Create complementary demand to smooth arrivals without requiring customers to change their behaviour
Request	• **Make sure many employees with specialized skills are on hand** • **Train employees to handle many kinds of requests**	• Hire lower-cost specialized labour • Automate tasks • **Create self-service options**	• Require customers to make reservations for particular types of service • Persuade customers to compromise their requests • Limit service breadth	• Limit service breadth • Target customers on the basis of their requests
Capability	• **Make sure employees are on hand who can compensate for customers' varied skill levels** • **Do work for customers**	• Hire lower-cost labour • **Create self-service options that require no special skills**	• Require customers to increase their level of capability before they use the service	• Target customers on the basis of their capability
Effort	• **Make sure employees are on hand who can compensate for customers' lack of effort** • **Do work for customers**	• Hire lower-cost labour • Create self-service options with extensive automation	• Use rewards and penalties to get customers to increase their effort	• Target customers on the basis of their motivation • Use a normative approach to get customers to increase their effort
Subjective Preference	• **Make sure employees are on hand who can diagnose differences in expectations and adapt accordingly**	• Create self-service options that permit customisation	• Persuade customers to adjust their expectations to match the value proposition	• Target customers on the basis of their subjective preferences

Table 5. Strategies for managing customer-introduced variability (Frei 2006) at the XXXX.

Conclusions and recommendations for capacity management

Effective capacity describes the maximum throughput rate which is an expression of volume over time. Increasing effective capacity therefore requires operators to either increase the volume that can be processed or shorten activity time per flow unit on the critical path of the process, the critical path being the sequence of activities that define the minimum possible duration of the process.

All systems have resource limits that set how many flow items can be processed. An obvious example is the number of bedrooms in a hotel or the number of tables in a restaurant, at times the front desk rate limiting resource was the availability of labour. If a resource limits the rate of processing then it is on the critical path of the process. Activities that are not on the critical path may be lengthened or delayed without any impact on process duration. Observations revealed that physical capacity is the main limiting factor at breakfast; labour and equipment are the main limiting resources at the front desk. Flow time at breakfast is represented by the actual time that servers spend serving customers and resetting tables, this is already brief. The hotel cannot control how long customers choose to spend over breakfast or when they arrive to demand service. Flow time at check-in is dependent only partly on the standard check-in procedure; customer request variability can be a significant source of variability.

Anupindi et al (2012) recommend the following strategies to increase throughput and capacity:

- **Increase the processing capacity** of the rate limiting resource.
    - Shorten flow time at the bottleneck.
    - Add capacity (space, labour, equipment, materials, time).
- **Shorten flow time**: Concentrate on the critical path.
    - Reduce the number or duration of activities.
    - Identify and eliminate waste.
    - Complete activities in parallel instead of serially.
    - Move activities to pre-process or post-process.

Variability results in variable process time and variable resource demand for each activity or flow unit. Variability is inherent in all processes, however, those that involve people are subject to more variability. Given the customer-orientated service culture of hospitality the main aim should be to accommodate customer variability. The main aim should be to reduce variation that is within the control of the hotel, such as labour capability, ill-defined or over-complicated operating procedures and waste (errors and equipment break-downs for example). Inevitably the hotel has to find a suitable balance between cost and customer satisfaction, but there may be ways to make capacity more flexible or more absorbent at little or no extra cost. Actions for addressing the two broad categorisations of variation are given below.

Accommodate (mainly customer):

- Flexible capacity:

    - Space: Allows a varying number of customers to co-produce, but give them enough space.
    - Equipment: As a replacement for labour.
    - Labour: Casual and part-time, task variety so all time filled.
- Shorten and reduce frequency of service encounters: Less opportunity for variation, greater absorption of arrival variation by labour.
- Demand forecasting to identify required resources and put them in place.

Reduce (mainly resource and activity):

- Limit service variety: Less opportunity for variation.
- Simplify product or service: Less opportunity for variation.
- Conformance standards: Standard way of doing the job.
- Recruitment and training: Select suitable staff and train them.
- Maintenance procedures: Keep equipment working.
- Demand management: Influence arrival times.

Labour capacity was observed to be flexible in both services. Space in the restaurant was limited. A rearrangement of space and activities could allow the provision of a hot buffet, while this may free labour for other tasks it may have no impact on dwell time (therefore also throughput rate). Demand forecasting does help plan resource acquisition and allocation but actual arrival times and patterns of arrival are not predictable this requires flexible capacity, mainly in the form of labour, to absorb the variability.

Operations management theory has its roots in agriculture and manufacturing, it emphasises the minimisation of input resources and the maximisation of the difference between the cost of inputs and the value of outputs. This can mean that the elements of service that are difficult to value, such as the value of social interaction, end up being given no value and are stripped out. The end result can be an anonymous and soulless experience for customers. If social interaction is valued by customers then available labour must be sufficient to allow time for social interaction and the substitution of labour by equipment may not satisfy the needs of customers.

Generally the more complex activities are, or the greater the variety of activities required of employees, then the longer it takes them to learn how to get them more correct more of the time. Activity repetition / familiarity also tends to result in activity time reduction (Bicheno, 2008). Improvements to process design can be achieved by using techniques such as Service Blueprinting (Bitner et al, 2008). By analysing the activities in the processes the necessary knowledge, skills and equipment can be identified. A standard way of doing a job in service needs to represent an ideal rather than a performance measure, the needs of the customer need to remain the top priority and flexibility in process delivery needs to be retained. The server needs to guide and respond to the customer rather than confining themselves to a set script. There is little scope for using demand management tools (mainly pricing and promotion) to influence arrival times in the observed processes. The number of observations were limited, if there are regular times at which demand for capacity exceeds available capacity then customers could be advised of this so that they have the choice to avoid those times and are psychologically prepared for delays if they cannot.

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Appendix: Breakfast

The XXXX, Breakfast Notes

Breakfast is served in the restaurant from 6.30am to 10.00am Monday to Friday, times change slightly at weekends. The restaurant observed had 67 covers arranged as shown in the table below.

Tables and size	Covers
17x2	34
7x4	28
1x5	5
Total	67

There were three observation sessions, the Tuesday observation started at 6.00am and finished at 9.41am. Service was observed from 6.45am to 9.30am on Wednesday and from 6.54am to 9.33am on Friday. The observer occupied a table in the corner of the restaurant and recorded various timings. General observations were made about behaviour observed that may affect speed of service.

Breakfast is self-service for cold items, such as pastries, cereals, yoghurts and juices. The buffet is located in the bar approximately 15 metres outside the restaurant. Menus are placed on each table and orders are taken for hot beverages, toast and cooked items.

Tables are set for breakfast the night before, each setting consists of a side plate, cutlery, a cup, saucer and teaspoon, salt & pepper, sugar bowl, pots of jam, pats of butter, jugs of milk, a linen napkin (paper on Friday) and a menu. One member of staff arrives at 5.30am to start setting up the buffet, a second joins at 6.00am, any remaining staff arrive at 7.00am. Additional staff can be called in from conference and banqueting as demand dictates. At peak service on Tuesday a total of six staff were working, on Wednesday four staff and on Friday two staff.

There appeared to be no clear division of labour, all staff showed guests to tables, took orders, delivered orders and reset tables. One interviewee however indicated that at busy times specific roles were allocated to different members of staff. The basic service process as observed is shown in table 6.

Task with customer
• Welcome guests at the restaurant entrance (but not always), ask how many in their party and show them to a table. • Ask their room number. • Ask if they would like tea or coffee and toast. • Draw attention to the buffet and menu. • Ask if they would like to place an order for cooked items. Leave and return if guest wishes to browse the menu • Clear dirty items from occupied tables and check satisfaction

Table 6: Basic observed service procedure

A report of expected numbers for breakfast was provided. The house count was reported as follows: Tuesday 107 with 94 having breakfast included in the rate; Wednesday, 116 with 105 inclusive of breakfast; Friday, 73 with 49 inclusive.

The observer was able to record the arrival and departure time of many, but not all, guests entering the restaurant. At the busiest times it is not possible for one observer to keep an eye on all arrivals, departures and tables. This task is made more difficult as often a guest is joined by a colleague part way through their breakfast. He also attempted to note, as many times as possible, the time that hot food was ordered and then delivered to each table. Over the three days observations were made of the arrival and dwell duration times of 113 tables, and the hot food order and delivery time of 61 tables. It should be noted that results were mainly recorded by table, on occasions when a guest joined a table that was already occupied times were recorded individually. Some guests ordered hot food as they were being seated, the rest of the time servers returned to the table after a few minutes to take the food order.

No queuing was observed, apart from the occasional brief wait to be seated. The restaurant was nearly full at the peak time on Tuesday, however, there were a number of empty dirty tables. From the observers viewpoint staff were slow to clear and reset tables on Tuesday, at 07.14am 21 dirty settings were counted. The numbers in the restaurant started to increase shortly after 7.30am and began to decline around 8.45am. The breakfast supervisor commented that she placed a particular emphasis on clearing and resetting tables, staff were not observed to be idle, it is thus assumed that they were engaged on other tasks.

On Wednesday more guests had breakfast included in the rate and the observer was expecting to be asked to vacate the table, however, at the busiest time there were less than 40 guests in the restaurant. Instead of there being a peak arrival time the arrival time of guests was more evenly spread throughout the service period. It was also noticed that staff were able to quickly clear and reset tables. This finding emphasises that it is not just the number of guests or their dwell time that affects how full the restaurant is, it is also the spread of arrival times.

	Tue (35 obs)	**Wed (47 obs)**	**Fri (31 obs)**	**All (113 obs)**	**All (61 obs)**
	Dwell Duration	**Dwell Duration**	**Dwell Duration**	**Dwell Duration**	**Order to delivery**
Average	00:27:09	00:22:59	00:31:18	**00:26:33**	00:09:19
Median	00:25:05	00:23:05	00:33:05	**00:24:30**	00:08:55
Standard Deviation	00:12:22	00:07:41	00:11:53	**00:10:58**	00:03:28

coefficient of variation	45.55%	33.46%	37.97%	**41.29%**	37.22%
Minimum	00:07:00	00:07:00	00:12:50	**00:07:00**	00:02:20
Maximum	01:04:00	00:48:00	01:02:50	**01:04:00**	00:19:00
Range	00:57:00	00:41:00	00:50:00	**00:57:00**	00:16:40

Table 7: Summary breakfast observation statistics.

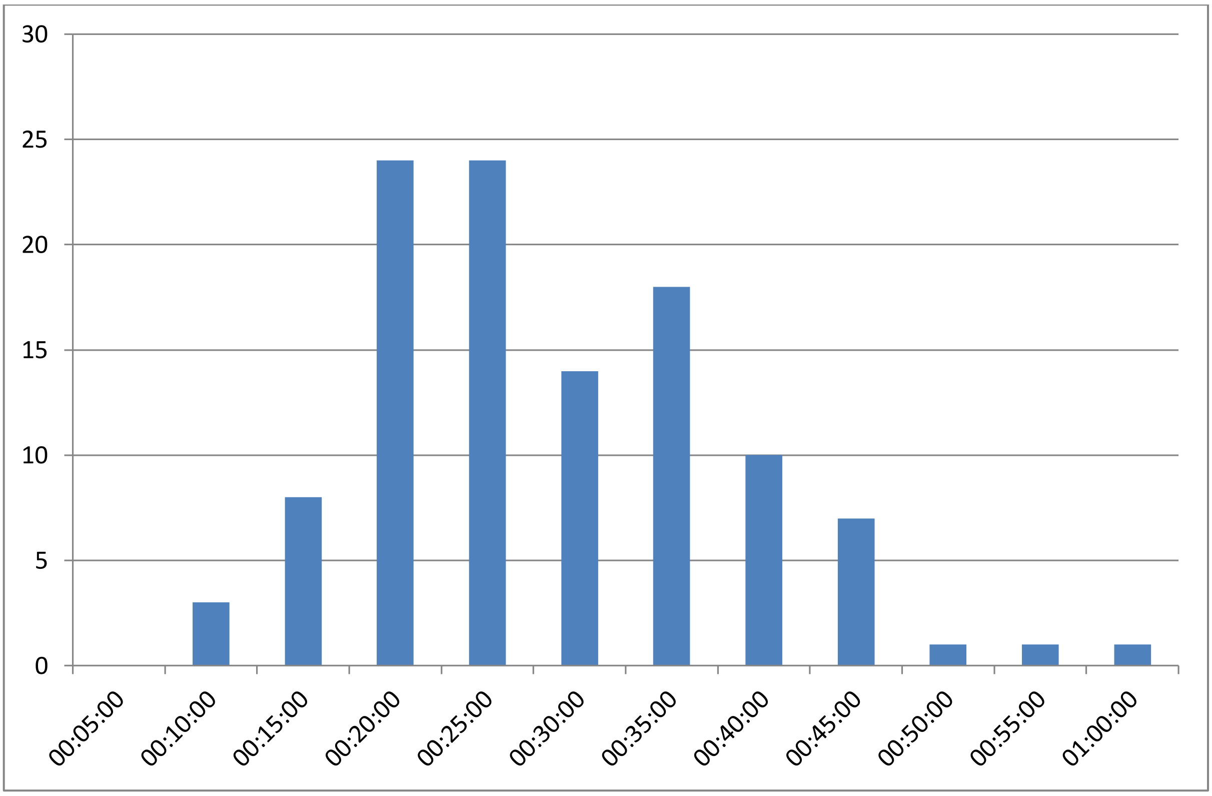

Figure 10: Chart showing frequency of dwell duration.

Table 7 shows the summary statistics for dwell times and the elapsed time between food ordering and delivery. The average dwell time over the three days was 26:33 minutes, however the median figure was a little less indicating that a few tables with a long dwell time have skewed the data, the frequency chart (figure 10) illustrates this. Guests seemed to spend longer at their tables on Friday. Customers are in control of their arrival and dwell times for breakfast, the main limitation is that, if they want hot food, then they need to wait for it to be cooked and delivered. Guests were observed chatting to others on their table, reading or staring out of the window. It was not uncommon for a guest to be joined by a colleague part way through their breakfast.

If it is assumed that the dwell data conform roughly to a normal distribution then it can be assumed that on 66% of occasions the actual times falls within one standard deviation above or below the average (mean) time. The coefficient of variation is the standard deviation expressed as a percentage of the mean, the greater this figure is the greater the amount of time variability in the data. Table 7 and figure 10 indicate that there is significant variation in the dwell time of customers.

	frequency
00:05:00	5
00:06:00	2
00:07:00	7
00:08:00	8
00:09:00	9
00:10:00	10
00:11:00	5
00:12:00	5
00:13:00	1
00:14:00	2
00:15:00	4
00:16:00	0
00:17:00	0
00:18:00	2
00:19:00	1
00:20:00	0
00:21:00	0

Table 8: Frequency of hot food order to delivery times.

Table 8 shows the frequency of order to delivery times observed. Most food orders took more than 6 minutes but less than 12 to prepare and deliver. The average order to delivery time was 9:19 with a median time of 8:55 indicating a slight skew towards shorter delivery times. In the final report data from this hotel will be compared with data from other hotels, at that point it may be possible to conclude whether waiter service of hot food adds to the average dwell time. As noted earlier, however, it is not just how long guests occupy the tables that matters, it is the pattern of arrival. Guests decide this for themselves and, as noted above, on occasions their arrival times may be spread, at other times they may be bunched together. While average dwell times and variance can be measured arrival times are unpredictable.

The XXXX Hotel has 115 bedrooms and the restaurant has 67 covers. If all rooms were occupied by two guests and all had breakfast then 230 breakfasts would be demanded. If 80% of rooms were occupied by only one guest then 138 breakfasts would be demanded. It has been noted that frequently guests stay in the same hotel as a colleague, thus even though the room may have single occupancy a table may be shared at breakfast. On occasions it was observed that four, six or even more guests appeared to know each other and ate together at breakfast. This also impacts on the demand for tables.

Observed sources of time variation that can be attributed to the organisation were as follows:

- Mise-en-place preparation
- Time from arrival to food order

- Time from food order to delivery
- Time resetting tables / availability of set tables

Observed sources of time variation that can be attributed to the customer were as follows:

- Arrival time
- Volume consumed
- Time to order food
- Chatting to colleagues
- No glasses, waitress reads menu to customer
- Dwell time

The restaurant supervisor (XXXX), who has worked breakfast in the hotel for 10 years, revealed that there is also a dining room on the floor above and that, on occasions, breakfast service is extended over the two floors. For practical reasons this restaurant is provided with a hot and cold self-service buffet. In response to the question as to why there was not hot buffet in the observed restaurant she replied that there is insufficient space. XXX, was also interviewed, she is a hospitality graduate and has been working in this hotel for about five months. XXX suggested that, in her experience, service can be speeded up if guests are allowed to serve themselves from a buffet. XXXX mentioned that, on occasions she had politely encouraged guests to leave tables, explaining that they were needed for waiting guests.

Capacity can be viewed as consisting of space and time (Slack, 2010). If the amount of time spent with customers is shortened more customers can be served with the staff available (Schmenner, 2004; Anupinidi, 2012). Sufficient physical capacity (space) needs to be provided for customers to consume at a pace that suits them. The main limitation for the

XXXX is that, on occasions of high demand, the restaurant may not be of sufficient size to absorb the physical demand. It is beyond the scope of this project to suggest solutions, however theory is presented in the report that may be used to generate and evaluate solutions.

Appendix: Front Desk

XXXX Hotel Reception Notes

The XXXX Hotel has 115 bedrooms and is located in the centre of Birmingham. Two periods of observation were undertaken from a chair in the lobby and one from behind the front desk. The time of arrival to check-in and the duration of check-in were recorded. Notes were made of other observed reasons for guests to approach the desk. The front desk was observed from 15:50 to 19:10 on Tuesday, 15:40 to 19:30 on Wednesday and from 15:50 to 19:30 on Thursday.

A total of 68 check-ins were observed and timed, the summary statistics are shown in table 9. Apart from two check-ins all arrival times and durations of check-ins were recorded.

	Queue	Service	Interarrival
Average	00:01:13	00:03:08	00:07:24
Median	00:00:00	00:02:40	00:03:30
Standard Deviation	00:02:39	00:02:45	00:10:23
coefficient of variation	218.11%	87.31%	140.53%
Minimum	00:00:00	00:00:15	
Maximum	00:11:30	00:18:50	
Range	00:11:30	00:18:35	

Table 9: Key summary statistics from check-in observations.

The average check-in time was a little over three minutes with a median figure of 2:40 minutes. This suggests that there were a lot of shorter check-in times and a few very long check-in times, the frequency table (table 10) illustrates this. Note one check-in of 14 minutes and one of nearly 19 minutes were recorded but excluded from the frequency data. The 14 minute check-in was due to a misunderstanding between the customer and the hotel over the status of the booking and involved a search for the booking and time re-booking the guest. The 19 minute check-in was because timing started when the customer reported to the desk, but then requested help with luggage from the taxi rank. In addition this was a reservation for three rooms for 14 nights.

Service Duration half mins	Service Duration Frequency	Cumulative %
00:00:30	3	4.55%
00:01:00	1	6.06%
00:01:30	5	13.64%
00:02:00	8	25.76%
00:02:30	8	37.88%
00:03:00	21	69.70%
00:03:30	9	83.33%
00:04:00	2	86.36%

00:04:30	4	92.42%
00:05:00	2	95.45%
00:05:30	0	95.45%
00:06:00	0	95.45%
00:06:30	0	95.45%
00:07:00	3	100.00%

Table 10: Check-in duration grouped by frequency.

There was some queuing for check-in, this is because the inter-arrival pattern was characterised by a lot of short inter-arrival times (table 11) and, on occasions, only one member of staff was available. Random events are characterised by having a lot of short inter-arrival times for events and fewer events further apart, generally they conform to an exponential distribution, this is illustrated in table 11. If queuing is to be avoided in systems where guests arrive at a time of their own choosing (randomly) then capacity must be provided to absorb the variation. This can be either in the form of spare physical capacity (such as staff or equipment), or flexible physical capacity (such as cross-trained staff or dual use equipment).

Inter-arrival times	**Inter-arrival time frequency**
00:01:00	25
00:02:00	5
00:03:00	1
00:04:00	7
00:05:00	2
00:06:00	4
00:07:00	3
00:08:00	2
00:09:00	0
00:10:00	0
00:11:00	3

00:12:00	0
00:13:00	0
00:14:00	3
00:15:00	0
00:16:00	0
00:17:00	1
00:18:00	0
00:19:00	1
00:20:00	1

Table 11: Inter-arrival frequency of most arrivals.

It was noted that there are three counters at the front desk but only two are equipped. There were generally two staff on duty but many occasions when one was unavailable to check-in customers. The manager was observed to help if he happened to be close to the desk when there was demand for service, no other staff were observed helping. The statistics record one customer having to wait over 11 minutes to check-in, however, it should be noted that they were part of a group of several guests who arrived simultaneously.

The front desk was observed for nearly 11 hours, the total duration of the check-ins was just over 3:30, and some of those were simultaneous. At no time were front desk staff observed to be idle, therefore, more of their time is spent doing tasks that do not involve checking-in customers.

Reasons for check-in queue and time variation rooted in the organisation

- Query disagreement between customer reservation and details on the system
- Staff away from desk on other tasks, requiring other guests to wait
- Staff engaged with enquiries of customers already checked-in

- Taking debit or credit card swipe
- Amount of information about hotels services given

Reasons for check-in queue and time variation rooted in the organisation

- Guests arriving in bunches (perhaps this is due to proximity to the railway station?)
- Queries from guests for clarification on payment methods
- Queries from guests about room type and location
- Query disagreement between customer reservation and details on the system
- Retrieving payment card or paperwork
- Questions about hotel services

Variety of requests and tasks observed

- Check-in
- Routing in-coming telephone calls (reservations has a different line)
- Storing and retrieving left luggage
- Reprogramming room key cards
- Updating some details after check-in
- Checking meeting room postings
- Maintenance issue reported
- Chasing up on reported maintenance issue
- Giving directions to meeting rooms
- Booking a taxi
- Directions to shops and other hotels
- Restaurant recommendations and directions
- Validate car parking tickets
- Answering queries about parking
- Helping with luggage
- Moving guest to a new room because of unresolved maintenance issue
- Drinks orders for the foyer lounge
- Printing reports
- Trying to contact housekeeping
- Taking payment for foyer lounge drinks
- Taking payment for late check-out

- Putting cash in the safe
- Filling in forms for petty cash expenditure
- Looking for an iron and tooth brushes
- Going out to buy tooth brushes
- Staff training

Check-in procedure

Micros Opera system is used in this hotel.

Observed

- Eye contact, greet, ask how can help if customer does not give a purpose
- Ask name if not given
- Confirm details of room type, length of stay, what is included in the rate and the payment arrangements
- If address details are missing ask for the post code and house number
- Ask if would like to provide an email address
- If customer is to pay some or all of the account ask for a credit card to pre-authorise payment or a debit card for pre-payment. Advise of handling fee if using credit card.
- Give registration card and key card for signature
- Cut key and tear off key card section of reg. card
- Ask if would like newspaper or wake-up call, ask if want to make dinner reservation
- Ask if stayed before;
    - if yes skip to next line, if no, explain bar and restaurant locations and breakfast times, how to use key in room, then,
    - (welcome back) wish a pleasant stay, give key and key card and direct to room, offer help with luggage.

Appendix: Interviews

Interviews XXXX

All interviewees were asked the three questions below:

1. Can you think of things that you do that speed service or reduce waiting time for customers
2. Can you think of anything that slows down service, causes delays or queues?
3. Can you suggest any changes to service or the service area that may speed up service?

Reception Supervisor

Can you think of things that you do that speed service or reduce waiting time for customers

We pre-register groups. We cut the chit chat. In theory a duty manager should be available to help out. In practice this is not always the case.

Can you think of anything that slows down service, causes delays or queues?

If guest has booked online but Head Office has not put the reservation on the system

Sometimes at weekends web sites are left open to sell when the hotel is full, resulting in overbooking and having to book out.

Sometimes there are computer failures

Actually check-outs can take longer than check-ins because some guests question items on the bill. We are looking at ways that the night team can speed check-out, putting bills under the bedroom door, for example.

Can you suggest any changes to service or the service area that may speed up service?

Computer screens are too low, do a lot of typing, being able to sit would be good

Insufficient staff, but not in terms of numbers it is when they can be scheduled to work – need more at morning check-out not mid-morning after check-out.

The duty manager is not always available to help

Regular guests are quicker to check-in as have all the details on the system.

Breakfast supervisor

Can you think of things that you do that speed service or reduce waiting time for customers?

Have additional dining room upstairs that can be used when busy, is equipped with hot and cold buffet.

Sometimes politely try to move guests off tables if customers are waiting

Can you think of anything that slows down service, causes delays or queues?

Sometimes when it is busy we could do with two breakfast chefs, sometimes I pop behind to help out

If tables are not cleared and reset quickly enough

Can you suggest any changes to service or the service area that may speed up service?

Perhaps a bigger dining space, if we could seat 100 that would be nice.

Breakfast servers (1)

Only one server, Yang, was available, she has worked in the post for about five months but is a hospitality graduate.

Can you think of things that you do that speed service or reduce waiting time for customers

Allocate different sections and different responsibilities when busy

Easier to do hot food as a buffet, in Ireland we served 30-50 guests with one member of staff

Can you think of anything that slows down service, causes delays or queuing?

Sometimes not enough chefs

Can you suggest any changes to service or the service area that may speed up service?

The layout of the building is difficult to change, the restaurant size is limited

In China most hotels have wireless ordering instead of paper, this speeds things up.

Staff need to prepare more things from storage, for example, de-caff coffee.

Appendix : Reception observation

XXXX Front Desk Observations

On Thursday March 29th the observer moved behind the front desk and recorded the following observations. A= XXXX, J = XXXX, GM = XXXX

Thursday March 29th

Time	Notes
15:50	GM and engineers attempting to sort problem with fire alarm system
15:50	Trying to send fax for customer but line seems permanently engaged
15:57	Request for room change, room smells of paint. J. doing admin, stapling paper to plastic envelopes
15:59	Guest arrives for check-in, 3 rooms for 14 nights. A requests payment upfront or credit card to authorise full payment Guest goes away to look for rest of party A & J discussing why the safe cash did not balance A answers phone
16:07	Customer asks if envelope waiting for them. A can’t find anything, makes a phone call and sorts

16:08	Key to meeting room not working
16:08	Phone ringing, no one available to answer it
16:14	Query about parking costs Earlier check-in guest and family return J goes to help with luggage 16:18 check-in complete
16:18	Request to validate parking ticket
16:20	Customer reports glass on floor of courtyard, A phones someone to get it cleared up.
16:20	Check-in, A answers phone while checking-in customer
16:22	A takes call, forwards it Putting in address details for family just checked-in
16:30	A makes reservation for staff member, prints and files a copy, explains system to me
16:39	A checking postings to a meeting room
16:39	Incoming call
16:41	Internal call, goes to check something then comes back to phone
16:43	Incoming call, forwards it
16:44	Incoming call, forwards it
16:46	Internal call, requested cot not in room, A call various extensions to find someone who can put cot in room
16:50	Check-in – system not working, A suggest customer goes to bar while it is sorted A makes call to find out why system down (being worked on) A makes call to bar to ensure comp drink
16:57	Internal call to say system back up
16:57	Internal call, maintenance, problem with telephone
16:50	Enquiry as to where to get a drink
16:59	Internal call for A to check if system working, it isn't – it is.
17:01	Incoming call to transfer
17:01	Internal call for A
17:05	Incoming call to transfer
17:07	Internal call Printing emergency reports, A says that this has to be done every few hours in case of emergency or system crash.
17:10	More incoming calls to transfer
17:13	Internal call
17:13	Room key not working

17:15	A checking key cutter, J says it isn't working
17:17	Check-in, takes incoming call and forwards it while checking-in
17:18	Room key not working
17:21	Person asks permission to display brochures in brochure rack
17:27	Internal call about using internet
17:29	Internal call for A
17:30	Internal call
17:32	Internal call A explains petty cash procedure. Also chat – when busy feel under pressure, used to be three staff plus concierge, but sometimes was too many. Now only two staff and two terminals so too much to do and answer phones. Commented earlier that phone system is due to change so that more departments can be called directly.
17:38	Incoming call for directions to car park
17:39	Check-in. Not eating 6.00am to 6.00pm so any chance of a few pastries at 5.30am? A indicates that it should be possible, will let customer know
17:42	Internal call
17:44	A calls to try and sort food alternative for customer
17:48	Restaurant staff come for dining reservations book, A goes through it
17:52	Internal call
17:52	GM sorting something in diary
17:53	Check-in. Asks if swimming pool? Additional price for a double? Breakfast included? How much extra? Asks for toothbrush, A says will arrange. Later sends J to search for tooth brushes and iron – has trouble locating them – note that 30 mins later guest rings down to chase up A goes to back office to cut key as key cutter on terminal not working
17:59	GM discussing with A about which rooms to mark as unavailable because of decorating, need to change on system
18:01	Check-in
18:09	Customer here last night, some power issues in room – has been allocated a new room but luggage not moved. GM sends J to help customer move.
	A been doing staff rota, staffing based on expected number of guests
	A gives J some training on Opera system
18:31	Internal call
18:31	Incoming call
18:34	Late check-out – actually hotel company IT man, comes behind desk and immediately notes that power cable to key cutter is disconnected, plugs in – key cutter fixed.
All quiet	Ask A questions until 7.00pm

APPENDIX 5: BREAKFAST DATA COLLECTION SHEET EXAMPLE

Breakfast Observation Log Sheet

Date: Location: XXXX Hotel

Table	Arrive	Order	Deliv	Depart	Notes

APPENDIX 6: FRONT DESK DATA COLLECTION SHEET EXAMPLE

Front Office Observation Log sheet: Follow customer

Date: Location: XXXX

Queue	Serve	Depart	Notes