

**DETERMINANTS OF EFFECTIVE CAPACITY IN
TERTIARY EDUCATION INSTITUTIONS IN KENYA**

**BY
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**A management Research Project Submitted in Partial Fulfillment of The
Requirements For The Award of Master of Business Administration (MBA)
Degree, School of Business, University of Nairobi**

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DECLARATION

This management research project is my original work and has not been submitted for a degree or any other award in any other university.

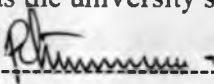
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To anyone else not listed above, it may be impractical to mention all of you by your individual names, but I greatly recognize your effort and contribution to the completion of this project.

DEDICATION

I dedicate this project to my family and in particular my husband Burton Kibui, to our children Neema Wanja and Gideon Karuri, for giving me the reason to study and work hard, and to my mother Peris Muthoni, for the effort and sacrifice you made in bringing me up and teaching me the value of education.

ABSTRACT

Tertiary education has always been an important priority in the public agenda. It is a repository and defender of culture, an agent of change in the culture, an engine for national economic growth, and an instrument for the realization of collective aspirations (Gerald, 1995). Furthermore, the public interest in tertiary education is generally present whether the delivering institutions are publicly or privately owned and/or are publicly or privately financed. However, the modern world of tertiary education is undergoing enormous challenges in various aspects such as expansion and diversification, fiscal pressure, wide markets, demand for greater accountability, greater quality and efficiency. This calls for the proper management of the institutions in order to cope with these challenges (Johnstone, 1998).

Hayes et al (2005) defines capacity as the level of activity or output that can be achieved (by an operation, facility or organization) in a given period of time under normal working conditions. Effective capacity refers to the volume that a workstation or process can produce in a given period under normal operating conditions. This allows for set-up times, breakdowns, stoppages, maintenance etc. To be able to manage capacity efficiently, the determinants of effective capacity in every organization need to be established.

The study aimed at identifying the determinants of effective capacity in tertiary education institutions in Kenya and to establish the relative importance of the determinants. The study was a descriptive survey where data was collected using questionnaires with both closed and open ended questions. A total of 60 respondents

from 30 tertiary education institutions in Kenya were interviewed and the response rate was 78%.

Findings of the research indicated that there are many determinants of effective capacity in tertiary education institutions in Kenya. The most important were established as operational, facilities and human factors. Other determinants, in order from most to least important were process, external, policy, service, supply chain and other factors.

Limitations of the study were that the respondents did not have enough time to fill the questions and some had a tendency to conceal some information. From the results, it is recommended that tertiary education institutions should seek to know the determinants of their effective capacity if they are to manage their capacity well.

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CHAPTER ONE: INTRODUCTION

1.1 Background

The services sector is gaining more and more relevance in the international economy; and as a result, research is being attracted in to the management of this field. There are numerous enterprises that currently develop their functions in the services sector. In spite of their particular characteristics of heterogeneity, perishability, intangibility and simultaneity, Hope and Muhlemann (1997) state that services also present similar problems to those of manufacturing. This leads to consideration of the possibility of extrapolating techniques traditionally employed in the manufacturing sector to solve problems of activities belonging to the service sector (Fry et al, 1994).

Capacity decisions are concerned with the ability of an operation to meet customer demand and to respond to changes in that demand over time. As such, they lie at the heart of operations management; since one of the main objectives of operations management is to satisfy customer demand. Not having sufficient capacity to meet customer demand means dissatisfied customers and lost sales opportunities. Having more capacity than required, implies under-utilized resources, which normally means higher costs than necessary and particularly higher unit costs (Dilworth, 1992).

Effective capacity refers to the volume that a workstation or process can produce in a given period under normal operating conditions. It is also defined as the actual maximum load or demand a device or system can carry or meet. Effective capacity can be influenced by the age and condition of the machine, the skills, training, and

flexibility of the workforce, and the availability of raw materials Both these capacity decisions are short term decisions and relate more to the team and individual resource level rather than to the branch or network which are associated with longer term increases or decreases in capacity such as building a new facility or purchasing additional equipment and recruiting substantially more personnel resource (Barnes, 2008).

1.1.1 Effective Capacity and its Determinants

The concept of capacity requires careful consideration, as it can involve decisions about the size and location of each of an organization's facilities, and the size, type and mix of equipment and the working practices (e.g. working hours and staffing levels) at a single facility. Once made, decisions about facilities and equipment can not be changed easily or cheaply and certainly not in the short term. However, there can often be more flexibility in deciding how to manage those facilities. Additionally, decisions about capacity inevitably affect an organization's ability to serve particular markets from any given location (Barnes, 2008).

Most operations don't normally work at their full capacity, as this tends to put a strain on both resources and people. Instead, they work at a lower level that they can sustain more comfortably over time. Based on this, there are two measures of capacity. The first is a designed capacity, which is the theoretical limit that can be achieved under ideal conditions with no disruptions or problems of any kind. The second is a more realistic effective capacity which is the maximum output that can be sustained over the long term under normal conditions. This allows for set-up times, breakdowns, stoppages, maintenance and so on. Thus, capacity is often not a fixed, absolute value,

but it is an agreed quantity that can vary according to circumstances. Effectiveness measures how well an organization sets and achieves its goals (Slack, 2001).

The designed capacity might give a more stable upper limit but the effective capacity is more variable and depends on prevailing conditions. Such conditions are caused by changes in determinants of effective capacity, which are facilities, products and services, human factors, processes, supply chains, operational, policy and external factors. Facilities factors refer to layout, design, location and environment of the facility. Process factors refer to quantity and quality capabilities of the production system. Human factors refer to job content, job design, training and experience, motivation, compensation, learning rates, absenteeism and labour turnover and knowledge. Operational factors include scheduling, materials management, quality assurance and equipment breakdowns. Products or service factors are design and product/service mix. Policy factors refer to management policies of the firm concerning production. Supply chain factors refer to the capacities of each player in the chain, both upstream and downstream. External factors are product standards, unions, safety regulations, pollution control and environment standards, stability of society and government (vanLooy, 1998).

1.1.2 Tertiary Education Institutions in Kenya

The overall goal of education is to foster national unity, social justice, rule of law, appreciation and protection of environment and use of information and communication (Kinyua, 2010). Kenya education vision is 'to have globally competitive quality education training and research for Kenya's sustainable development. Education is a merit good and as other merit goods/services, it is at

times provided to the society in a subsidized manner, otherwise it becomes too expensive and may subsequently be under consumed (Kinyua, 2010).

There are many middle level colleges, both public and private, that offer national and international diploma awards in a wide field professions. These are mainly located in larger towns. Tertiary education covers, technical training institutes, institutes of technology and national polytechnics. They form Technical, Vocational and Educational Training (TIVET) (Kinyua, 2010).

The institutions exist to provide unparalleled opportunities for learning and professional advancement into the today's world in Information Technology, Accounting and Management areas. There is a high demand for higher education in Kenya, and both the existing public and private universities cannot match the demand. The tertiary institutions are collaborating with local and international universities to start offering degree programmes. Further, the demand for their courses within the East African region and internationally has tremendously increased, so most institutions have initiated expansion plans to partner with international colleges and other centres within Kenya in their out-reach programmes (Ree, 1990).

Due to the high volatility of demand in services, capacity management is a must for every service delivery system if it is to offer high quality output. The education sector falls in the service industry. One of the characteristics of education service is that there is long time contact between the students and the lecturers, leading to loyalty. Capacity has to be well managed for that loyalty to be maintained (Fitzmmons et al, (1994).

1.2 Statement of the Problem

Effective capacity can be stated as the capacity which is immediately available to the operations manager, whereas potential capacity is the capacity which could be made available if the operations manager has time to make arrangements to increase capacity in the near future. Not all productive capacity is actually used or usable. It is important for operation managers to understand what capacity is actually achievable (Barnes, 2008).

The demand for college education is on the increase globally due to increased rate of population growth (Ree & Kilemi, 1990). Additional increases in demand for higher education may well be spurred by the clear recent signs of strong labour market rewards for college graduates and by the growing interest of employers and their employees in higher education as a means of increasing worker's human capital (Zumeta, 1996).

In the face of the growing demand for higher education, many public and private education systems are at or near capacity to enrol students and would have to build additional buildings or whole campuses and hire additional faculty to expand enrollments significantly short of radical reconfiguration of campus missions or delivery modes. Such expansion is likely to be a very expensive proposition on per student basis, especially for private colleges now that they receive no financial support from the government. Incremental costs to add students at institutions with excess capacity should be relatively low, certainly lower than per student cost of building additional capacity (Marshall and Tucker, 1992). This calls for a clear

understanding of each determinant of effective capacity so as to properly manage the capacity to match global standards (Ree and Kilemi, 1990).

Ochieng' (2006) in his study on capacity management strategies concluded that, although capacity management is faced by many challenges, good capacity management strategies are vital to the improvement of service delivery systems. Svetlana and Marc (2005), in their study on decision support system for managing capacity utilization in universities concluded that there is a need for academic workload management.

The above two studies highlighted the need for proper capacity management. To be able to manage capacity properly, the determinants of effective capacity in the specific industry need to be clearly understood. Once understood, the operations managers will then be able to manage each determining factor in the right way, thus leading to overall proper capacity management. It is in view of these observations that the need for carrying out research on determinants of effective capacity in tertiary educational institutions was established. The focus of this study was on Tertiary Educational Institutions in Kenya. The study sought to answer the question:

What are the determinants of Effective capacity at Tertiary Education Institutions in Kenya?

1.3 Objectives of the study

The study sought to establish the determinants of effective capacity in tertiary education in Kenya. Specifically, the study sought:

- i) To establish the determinants of effective capacity at Tertiary Institutions in Kenya.

- ii) To establish the relative importance of the determinants of effective capacity in tertiary education institutions in Kenya.

1.4 Importance of the study

The findings of the study would be useful to the following stakeholders:

- (i) In academia, it will add to the growing body of knowledge on determinants of effective capacity, and help to identify areas for further research in this concept.
- (ii) It will help provide valuable feedback to the organization's management. The knowledge of the determinants of effective capacity will help the organization to better manage their capacity resources.
- (iii) To other education institutions at tertiary and other levels, the results of the research will be useful in better management of capacity.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Service companies find themselves in an always changing environment. Competition is increasing, leading to smaller margins. The number of services offered to the customers is augmenting, leaving them more and more alternatives. Making sure that customers become and stay satisfied is crucial. To do so, being informed about one's own performance in terms of productivity and quality is crucial (Klassen, 2002). In this paper, literature on capacity management in the service sector, effective capacity and its determinants, problems in managing capacity in the service sector and empirical studies on capacity will be reviewed.

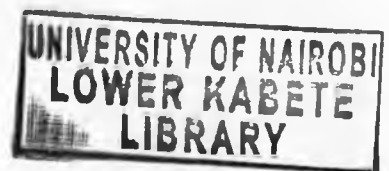
2.1 Capacity Management

Hayes et al (2005) defines capacity as the level of activity or output that can be achieved (by an operation, facility or organization) in a given period of time under normal working conditions. In a service setting, this might be the number of customers that can be handled between noon and 1pm. In manufacturing, this might be the number of books a printing firm can produce in a day. Capacity is a relative term; in an operations management context, it may be defined as the amount of resource inputs available relative to output requirements over a particular period of time (Klassen et al, 2002).

According to Armistead and Clark (1994), capacity management is the process of planning, analyzing, sizing and optimizing capacity to satisfy demand in a timely

manner and at a reasonable cost. They also see capacity management as a process with a broad scope that brings together business, service, and resource capacity needs to ensure optimal use of the resources to achieve the required levels of performance. In this regard, the manner in which capacity is managed is influenced by objectives which determine what must be achieved by an operating system structure, which influences what is feasible. Capacity management, therefore, is the most critical and strategic decision area of operations incorporating decisions on how to balance demand and the capacity of the service delivery system to satisfy the demand. A service firm's success or failure in the process of balancing quality of service and resource management, expressed in terms of resource productivity, depends on its skill in managing capacity to match demand (Armistead 1991).

In order to satisfy demand, service load, capacity task management and capacity leakage are very significant. In addition, the relationship of service capacity levels, its quality level and its methods of resources management should increase capacity (vanLooy et al., 1998). How much to increase capacity depends on the volume and certainty of anticipated demand, growth strategic objectives, customer service, competition, and the cost of expansion. Hence, the highest possible amount of output that may be obtained in a specific period of time with a predefined level of staff, installations and equipment is the capacity of a service firm. A system has capacity if it has at least some of the resources which are needed to perform its function (Lovelock, 1996).



The aim, therefore, of capacity management in the service industry is to minimize customer waiting time and to avoid idle capacity, with the goal of attending to demand in time and in the most efficient way possible (Adenso-Diaz, et al, 2002).

2.2 Capacity Management in the Service Sector

Service capacity is related in many similar issues to manufacturing capacity, but there are several important differences. Jacobs et al., (2008) states that service capacity is more time- and location- dependent, it is subject to more volatile demand fluctuations and utilization directly impacts service quality. Services cannot be stored for later use, thus the capacity must be available to produce a service when it is needed. The service capacity must also be located near the customer. The capacity to deliver the service must be first distributed to the customer (either physically or through some communications medium); then the service can be produced (Donald, 2006).

The volatility of demand on a service delivery system is much higher than that on a manufacturing production system for three reasons. First since services cannot be stored, inventory cannot smooth the demand as in manufacturing. Secondly, customers interact directly with the production system and these customers often have different needs, will have different levels of experience with the process, and may require different numbers of transactions. This contributes to greater variability in the minimum capacity needed. The third reason for the greater volatility in service demand is that it is directly affected by consumer behaviour. For example, demand for rooms at a hotel is higher during weekends than on weekdays (Jacobs, 2008).

Service firms seek growth of their business units in their overall market and their respective market share. This is because the greater the market share in terms of volumes, the greater is the profit for the organization. However difficulties in increasing capacity are about greater costs and overstretching present facility and labour, leading to other problems. At the same time insufficient capacity can result in turning down orders which could lead to customer dissatisfaction and the reality of declining demand. Because of its importance, these firms should integrate business growth and capacity planning for their own long term health (Ng et al 2001). Most do this by attempting to match capacity levels with their expected demand. Typically the objective of these firms is to develop a capacity profile that matches demand profile and yet retain its economic viability (Klassen and Rohelder, 2002).

Dilworth (1992) and Nahamias (2001) noted the need for an optimum choice of capacity that may be a close fit to demand profile by using appropriate forecasting models to arrest seasonal demand problems. In practice imbalances are managed by managing supply for a fixed demand, or managing demand for a fixed supply. Fitzsimmons and Fitzsimmons (1994), Karmarker (1996) and Sasser (1976) stress the importance of concurrently evaluating capacity and demand strategies.

2.3 Effective Capacity

Capacity can be refined into two useful definitions of capacity: Design capacity and effective capacity. Design capacity is the maximum rate of output achieved under ideal conditions. Effective capacity is usually less than design capacity owing to realities of changing product mix, the need for periodic maintenance of equipment,

lunch breaks, coffee breaks, problems in scheduling and balancing operations, and other similar circumstances (Angus, 1995).

In general, inadequate planning is a major limiting determinant to effective planning and sees the need to balance a firm's operating capacity as one way of solving this problem (Armistead, 1991). Many organizations operate below maximum processing capacity, either because of an insufficient demand to completely fill the capacity, or as a deliberate policy to respond to every new order. Often, organizations have some parts of their operations below capacity while others are at their capacity ceiling. It is the parts at capacity ceiling which are the capacity constraints and are causing bottlenecks for the whole operation. These parts would have to be improved to ease bottlenecks that constrain the whole operation (Armistead 1991).

2.4 Determinants of Effective Capacity

To determine effective capacity, there is need to maximize possible output; given product mix, scheduling difficulties, quality and machine maintenance, among others. Therefore, relevant factors that determine effective capacity include: size and the provision for expansion for existing operating facilities, the ability of the operations system to produce similar products or services while maintaining the required quality standards. In order to do this there would be need to separate tasks and activities to be performed by fully motivated, trained and skillful workers with considerable experience (Marshall and Tucker, 1992).

For efficient and satisfactory service delivery to the customer, operational factors such as appropriate scheduling and acceptable level of stock will be maintained to avoid late deliveries, while ensuring satisfactory after service support, inspections and

quality control procedures. It is equally important to consider the acceptance level of performance in the face of external forces which include the need to comply with regulatory standards that demand heavy paper work. In summary therefore, the main determinants of effective capacity are facilities, product and service, process, human, policy, operational, supply chain and external factors (Thacker, 2009).

2.4.1 Facilities

The basic meaning of facility is the space in which a business's activities take place. The design, location, layout and environment of the facility where production of goods or delivery of services is done are important components of a business's overall operations, both in terms of maximizing the effectiveness of the production process and meeting the needs of employees (Jacobs, 2008). Layout decisions entail determining the placement of departments, work groups within the departments, workstations, machines and stock-holding points within a production facility. The objective is to arrange these elements in a way that ensures a smooth workflow (in a factory) or a particular work pattern (in a service organization) and also ease flow of information (Sherali et al, 2003).

The key to good facility layout and design is the integration of the needs of people (personnel and customers), materials (raw, finished, and in process), and machinery in such a way that they create a single, well-functioning system. The facility should be designed in such a way that the production process or service delivery process is fast and secure. There should be enough space and proper arrangement in the facility (vanLooy, 1998).

The facility should be located in an area that has close proximity to customers, has favourable business environment and where total costs are minimized. Close proximity to customers ensures that customer needs are incorporated into the production process, and that the service/product is delivered on time. A favourable business environment can include the presence of similar-sized businesses and the presence of in the same industry. It is also important to consider pro-business government legislation and local government intervention to facilitate business location in an area via subsidies, tax abatements, and other support factors (Konz, 1985).

2.4.2 Product and service factors

Products and services are the main outputs of a firm and should therefore directly satisfy the demand of the customer (Barnes, 2008). If the design of the product/service required by customers is uniform in output, then standard materials and methods can be used, leading to greater capacity. Customized goods and services require special raw materials and methods, and may lead to less capacity. The product/service mix determines the output rates of the production system. Different items have different requirements of inputs in term of raw materials, costs, time, labour etc, and thus every product/service mix will correspond to the individual products/services making it. This leads to different output rates, and thus different capacities (Rhyme, 1998).

2.4.3 Process factors

A process is a set of logically related tasks or activities performed to achieve a defined business outcome (Hope, 1997). Product designers and manufacturing

engineers are particularly interested in process capability and develop process capability studies to help them predict how well a process will meet the required specifications or tolerances and to specify the amount of control necessary as well as the equipment requirements. Process capability is a measure of the uniformity of a process, or in other words, a measure of the ability of the combination of inputs and resources- employees and other people, machines, methods and materials- to consistently produce a product or service within design specifications or tolerances. Inconsistency results in too much scrap rework and lost time; which leads to wasted material and labour time, and thus less capacity (in quality and quantity) (Namahias, 2001).

Flexible processes also account for more effective capacity management. Flexible processes are epitomized by flexible manufacturing systems on one hand and simple, easily set up equipment on the other. Both of these technological approaches permit rapid low-cost switching from one product line to another, enabling economies of scope (Ignacio, 2006).

2.4.4 Human factors

Human capital is the contribution of people (their skills and knowledge) in the production of goods and services (Scarborough, 2003). Human capital contributes to the success of the firm in attaining its objectives and thus has to be properly managed. Human factors that affect capacity are job content, job design, training and experience, motivation, compensation, learning rates, absenteeism and labour turnover, and knowledge. Job content refers to all the data about an existing job, which activities are performed and what skills are required (Foot, 2008). Job design is

the process of identifying tasks that each employee is responsible for completing. It affects job satisfaction and productivity. Jobs may be simplified, so that they involve few tasks, or they may be expanded, so that they involve many tasks (Lussier, 2009).

Employees have to be taught how to perform a new job. Training is the process of teaching employees the necessary skills to perform a job. Development is ongoing education to improve skills for present and future conceptual, and decision-making skills in managerial and professional employees. Training and development constitute a good investment because they benefit individuals, and their organizations, and the economy as a whole. An employee who has done a job for some time has more experience in it and is most likely going to perform better. With time, he masters the processes and reduces the number of mistakes in the production or service delivery process. This increases his output, thus increasing the capacity of the organization. This also leads to motivation of the employee (Bagley, 2007).

Motivation is the willingness to achieve organizational objectives or to go above and beyond the call of duty (Kaiser and Kaplan, 2006). People who are satisfied with their jobs are more highly motivated. A motivated and satisfied workforce can contribute powerfully to increase the capacity of the firm. Another motivating factor to employees is compensation. It refers to the total of an employee's pay or benefits. If an employee is satisfied with his pay, he will be more satisfied with the job hence will be more productive. Dissatisfied employees lead to high labour turnover, which is expensive for the firm (Carlson et al, 2006).

Today's leaders focus on learning and knowledge management. Learning organizations have everyone engaged in identifying and solving problems, enabling change, and continuous improvement. They share three characteristics; a team-based structure, participative management, and the sharing of information through knowledge management. Knowledge is becoming more important to organizations as they compete in the information age and the knowledge economy. Knowledge management involves everyone in an organization in sharing knowledge and applying it continuously to improve products and processes. Knowledge is the firm's sole capability and is important to sustained capability to compete. Organizational performance depends significantly on how the organization manages knowledge (Foot, 2008).

2.4.5 Policy factors

A policy is a plan or course of action, as of a government, political party, or business, intended to influence and determine decisions, actions, and other matters. Capacity is particularly affected by management policies with regard to the number of hours worked each week. It is also affected by policies about levels of work-in-progress inventory and other capacity cushions, such as excess equipment and labour. Capacity may also be affected by managerial responses to performance measurement systems. For example, the costs of investment in plant and machinery will normally be amortized over a long period, whereas expenditure on labour and materials will normally be charged in the period in the month that they occur (Barnes, 2008).

2.4.6 Operational factors

Operations refer to the processes that are used to transform the resources employed by a firm into products and services desired by customers (Hill, 2005). The operations function is the 'doing' part of the organization and thus no organization can hope to be successful unless its operations are well managed. The activities of the operations function are central to achieving efficiency and effectiveness. Operations such as scheduling, materials management, quality assurance, maintenance policies and equipment breakdowns largely affect the effective capacity of the firm as it processes inputs into outputs (Dilworth, 2002).

Scheduling is the process of ensuring that materials and equipment are on site as needed to obviate delays in meeting the scheduled times for the completion of each part of the job in a production process or a service delivery process (Lysons, 2006). The objectives of work-centre scheduling are to meet due dates, minimize lead time, minimize set-up time or cost, minimize work-in-process inventory, and maximize machine or labour utilization (Jacobs, 2008). Proper consideration of capacity ensures that the schedule is feasible. For instance, a finite loading approach actually schedules in detail each resource using set up and run time required for each order. In essence, the system determines exactly what will be done by each resource at every moment during the working day. This enhances efficiency and effectiveness in capacity management (Lysons, 2006).

According to Jessop (1994), materials management is a concept that requires an organization that is adopting it to have a single manager responsible for planning, organizing, motivating and controlling all those activities principally concerned with

the flow of materials into an organization. Materials management views materials flow as a system. The main benefit which seems to arise from the adoption of the materials management approach is an improvement in communication and coordination between departments. There is less sub-optimization, and centralized responsibility and control, enabling smoother and faster flow of materials (Bradley, 2002).

Quality assurance involves taking a proactive approach towards quality management by seeking to prevent defects ever being produced. This usually involves the adoption of a quality management system (QMS), such as those based on the ISO9000 series of quality standards. The QMS has manuals which sets out in detail how the entire operation should be managed. The quality of inputs is assured by buying only from suppliers who themselves practice quality assurance. Acceptance sampling techniques may also be used on inputs. The whole focus moves towards proactively seeking to solve quality problems, attacking their causes and not their effects through various quality techniques. Equipment breakdowns need to be addressed on time to prevent slowing down the production process (Barnes, 2008).

2.4.7 Supply Chain Factors

A firm's ability to use its own capacity is often directly dependent on capacity up and down the supply chain (Rahman, 1998). A supply chain is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. Factors that determine the efficiency of a supply chain are trust

among partners, effective communication, supply chain visibility, matching of supply to demand and performance metrics (Simchi et al, 2007).

One of the most critical factors in a committed and collaborative relationship between supply chain partners is trust. If trust is present, it can improve the chances of a successful supply chain relationship; if not, transaction costs can rise through poor performance. Effective communication throughout the supply chain helps a company improve the efficiency of its supply and logistics operations. Networked communications enable all members of the chain to share essential market and operational information, improving productivity and reducing time-to-market. Regular marketing communication also builds teamwork by keeping all parties informed on developments that impact their operations. By bringing together all parties through communication, a company can build an extended enterprise that operates as a single, coordinated unit (Hines, 2004).

Supply chain visibility helps an organization better appreciate which segments, distribution channels, and value chain configurations will yield the competitive advantage. Indeed, the enterprise supply chain visibility spectrum is a balanced combination of technology and product drivers. Demand and supply must match for a supply chain to be efficient. This ensures that services/goods are available at time when they are required (Barnes, 2008).

To measure your supply chain effectively, identify metrics that are appropriate for your organization and that will improve business performance e.g. response time, material costs, inventory turns, transit time, productivity and equipment efficiency. A

correct measurement of the mentioned metrics enables the organization to anticipate corrective actions and practices as soon as the indicator scores a value below an acceptable threshold (Simchi et al, 2007).

2.4.8 External factors

An external factor refers to any issue that may affect the effective capacity, but which the firm may not be able to control directly, e.g. product standards, unions, safety regulations, pollution control and environment standards, stability of the society and the government (Donald, 2006).

The market sets the product/service standards, and the firm has to comply with that standard so as to remain competitive in the market. There are various unions that control issues in different industries e.g. trade unions and workers unions. Trade unions have laws regarding trading in various regions. Workers unions set rules regarding rights of workers (Klassen, 2002).

Pollution control and environment standards account for conservation of environment through proper use of natural resources and proper waste disposal. A stable society guarantees a favourable environment for effective capacity. In case of instability, huge losses are incurred resulting from absenteeism of workers, looting of property and high cost of raw materials. The business may even close down. The government sets laws concerning how organizations should be run. An organization therefore has to devise ways to adapt to the external factors for effective capacity to be achieved (Barnes, 2008).

2.4.9 Other Factors

There are many other factors that affect capacity, some of which include innovation, business process reengineering, total quality management, IT based information system, part time employees, capacity sharing and outsourcing. Business process reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements. An Information system is a structured set of processes, people and equipment for converting data into information. The use of computers enables information systems to be faster and more accurate, thus increasing their effective capacity. Use of part time employees enables the firm to employ capacity only when required, thus lowering costs. Outsourcing involves an organization passing the provision of a service or the execution of a task previously undertaken in-house to a third party to perform on its behalf. Many companies outsource and hire consultants in order to maintain a flexible workforce (Donald, 2006).

Organizational learning is the process by which an organization acquires the knowledge necessary to survive and compete in its environment. This includes the development of knowledge and understanding, shared among organizational employees, that leads to effective action in their output. Total Quality Management (TQM) is a management concept coined by W. Edwards Deming. The basis of TQM is to reduce the errors produced during the manufacturing or service process, increase customer satisfaction, streamline supply chain management, aim for modernization of equipment and ensure workers have the highest level of training. One of the principal aims of TQM is to limit errors to 1 per 1 million units produced. Total Quality Management is often associated with the development, deployment, and maintenance

of organizational systems that are required for various business processes (Kabiru, 2007).

2.5 Problems in Managing Capacity in the Service Sector

According to Adenso B (2002), the problem of capacity management is one of the most difficult to tackle in business management, a situation which is aggravated in the majority of services due to uncertain demand and personalized requirements which make it difficult to plan and assign productive capacity. While overstaffing implies extra costs, insufficient capacity implies a lower level of attention to customer needs and therefore a lack of perceived quality (Adenso, 2002).

In view of these problems, careful management is required while selecting capacity additions. This is because of the impact of changing facility focus and balance among production stages. This will in turn require the degree of flexibility of both the facilities and the workforce whose performance is further complicated by experience, specifically when introducing new processes or equipment. One way would be to increase the number of services in parallel with increasing the number of service outlets. This has challenges on quality of service offering. Further, there are likely effects of different economies, such as economies of scale, diseconomies of scale and economies of scope (Ng et al, 2001).

In summary, problems in capacity management emerge from the manner in which forecasting, prioritizing, scheduling, altering bottlenecks, capacity and coping strategies are used (vanLooy et al, 1998). In a sense, capacity management has a considerable impact on the quality of service perceived by customers (Rhyme, 1988).

2.6 Summary of literature review

Tertiary education institutions play a significant role in the economic and social development process all over the regions of the world. The growth of the education sector in Kenya and the increased capacity to cater for the large population leaves the whole state of managing the available capacity effectively wanting. There is a need therefore to find the factors that determine the effective capacity of the education institutions with an aim to better manage their capacity. This will bring a lasting solution to ensure that all students are provided with the much needed education.

The determinants of effective capacity are facilities, product and service, process, human, policy, operational, supply chain and external factors. They vary in importance in different industries. This study seeks to find which ones are important to the tertiary educational sector and how they rank in importance. This is the gap that this study seeks to bridge.

2.7 Empirical Studies on Capacity Management

There are numerous articles and empirical studies on capacity issues; associated with both manufacturing/production and service operations. Some issues related to capacity that were addressed are use of technology, scheduling, managing demand, outsourcing and coping capacity management as summarized below.

Goldsmith (2004) examined the use of technology to increase capacity of health care delivery systems. His findings were that use of technology hold promise to reduce the need of hospitalization and thus to increase overall utilization. He also found that

personalized medicine, regenerative medicine and remote patient monitoring can contribute to increased capacity. Millard et al (2004) in his case study on the impact of same day scheduling of performance in a public health clinic found that same day scheduling resulted in shorter wait time, more new patients and increased provider productivity. Renner (1999) investigated the use of outsourcing to meet fluctuating demand at a case study in a hospital, and found that outsourcing strategy as a major capacity management tool had a positive impact.

A study by Stuart Orr (1999) on the role of capacity management in manufacturing strategy: experiences from the Australian wine industry found that advanced processing technology is being used as part of a strategy for increasing capacity in this industry. It was also found that supply dependability and product cost/price were the most important competitive priorities for wine production, after product quality. All three of these were found to be directly influenced by the level of capacity management. It was also found that strategic position of capacity management in the manufacturing decision making process is linked to production planning and control, quality control and assurance.

A study by Lovelock (1996) on strategies for managing demand in capacity constrained service organizations found that each of the elements of marketing mix i.e. product elements distribution, pricing and communication has a role in managing demand, sometimes alone but often in concert with others. A study by Armistead (1991) on the coping capacity management strategy in services and the influence on quality performance found that managers are not good at managing capacity in relation to service quality. He proposed a coping strategy as a way of augmenting the

strategy of chase and level capacity management. Kim Shi et al (2004) in their study on managing capacity through reward programs found that reward programs add flexibility for firms to adjust their capacities to market demand and avoid intense price competition during the period of low demand. It was also found that firms can offer reward programs to reduce excess capacity.

A study by Bradley (2002) on managing capacity and inventory jointly in manufacturing systems found that capacity and inventory decisions are often made separately in practice because either the joint decision is complex or it is assumed that the interaction between the two production factors is small. They conclude that managers might employ a hierarchical decision process which separates the capacity and inventory decisions and use rules of thumb sometimes to set the capacity level. These rules sometimes favor high capacity utilization. A study by Angus (1995) on managing capacity and demand in a resource constrained environment found that the effective management of capacity and demand depends in the long term on fundamental reappraisal of both the function and funding of the organization.

A study by Ignacio et al (2006) on strategic capacity management with modular manufacturing and outsourcing; a case study, found that many factors influence the decision to expand manufacturing capacity, but a weak connection between capacity management and the business strategy causes multiple duplicated facility investments which leads to heavy cost structures. It also concluded that it is necessary to an organization to add or remove additional costs to reflect changes in the operations flow. Net present value and cash flow are the most useful tools for a company to use to determine the best alternatives.

Although there are numerous sources of information associated with capacity planning and management, the literature review on effective capacity is quite scarce; and therefore the need for research in this area. The research focused on determinants of effective capacity management issues with possible linkages to an institution of higher education.

1.2 The problem

The problem of an institution of higher learning is to determine the level of capacity required and to manage it in a way that is cost-effective and efficient. The institution must be able to meet the demand for its services, which is a function of the number of students, staff, and other resources. The institution must also be able to manage its capacity in a way that is cost-effective and efficient.

1.3 The objectives

The objectives of this study are to determine the level of capacity required and to manage it in a way that is cost-effective and efficient. The study will also determine the factors that influence the level of capacity required and to manage it in a way that is cost-effective and efficient.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

This study focused on determinants of effective capacity in tertiary education institutions. The study intended to uncover the relative importance of the factors that determine the effective management of capacity in the institutions. A descriptive research design of a survey type was used to ascertain the determinants of effective capacity. Survey method of a cross sectional type is often used to study the general behaviour, attitudes, values and characteristics of a population through the collection of quantifiable information from the sample (Mugenda and Mugenda, 2003). Survey research is therefore a type of descriptive research.

3.2 The population

The population of study consisted of all tertiary institutions in Kenya registered with the ministry of higher education, science and technology. As at 9th June, 2011, there were 534 registered tertiary educational institutions in Kenya (www.scienceandtechnology.go.ke).

3.3 Sample design

Since it is not easy to study all the tertiary education institutions, the study focused on institutions offering business courses in Nairobi that are registered. A simple random sample of 30 institutions was used. Two employees were selected from each institution, resulting in a sample of 60 respondents. These included the people in

charge of operations for each institution. These individuals were selected because they are directly responsible for planning in their institutions.

3.4 Data collection

Primary data was used for the study. The data was collected using a structured questionnaire consisting of open- and closed – ended questions. The questionnaires were administered using the drop and pick later method. The respondents of this study were the officers in charge of operations in the selected institutions.

3.5 Data analysis

The questionnaires were sorted and coded in the Statistical Package for Social Sciences (SPSS) software. These were the responses from the respondents.

The first objective: to establish the determinants of effective capacity at Tertiary Institutions in Kenya was addressed using descriptive statistics. The closed ended questions were analyzed quantitatively based on weighted means and standard deviations and presented in tables and charts.

The second objective: To establish the relative importance was addressed using weighted scores. Mean scores were used to show the relative weight of the determinants.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter covers data analysis, findings of the research and discussion of the major findings. The completed questionnaires were edited for completeness and consistency before analysis. The questionnaires were sorted and coded in the Statistical Package for Social Sciences (SPSS) software. The data was summarized and presented in the form of frequencies, percentages, tables and graphs. It documents the determinants of effective capacity in tertiary educational institutions in Kenya. Data was collected from 30 tertiary educational institutions. The officers in charge of operations in the respective institutions were the respondents. Of the 60 informants who were sampled, 47 responded, thus a response rate of 78 percent. None of the 47 questionnaires collected was considered unusable at the editing stage.

4.2 General Overview of Tertiary Educational Institutions

This section presents a general overview of all the 30 tertiary education institutions and the experience of the respondents who completed the questionnaires. It describes the number of years in existence, position of respondents and their experience in the institutions.

4.2.1 Year of Establishment of Institutions

The number of years that an institution has been established can determine how the institution can manage its capacity. The respondents were asked to indicate the year of establishment of the institutions and the results are in table 4-1.

Table 4-1 Year of Establishment of Institutions

Year	Distribution	
	Frequency	Percentage
2005 to date	3	12
2000-2004	6	23
1995-1999	8	31
1990-1994	5	19
Before 1990	4	15
Total	26	100

Source: research data

From the results in table 4-1, 12% of the institutions were started in the last 6 years, 23% in the last 10 years, 31% in the last 15 years, 19% in the last 20 years and 15% more than 20 years ago. This is an indication that we are dealing with institutions that have grown fully and capacity can be a challenge.

4.2.2 Number of Branches

Tertiary education institutions open additional branches to increase their market share and ease the management of effective capacity. The respondents were asked to indicate the number of branches of the institutions they were representing and the results are in table 4-2.

Table 4-2 Number of branches

Number Of Branches	Distribution	
	Frequency	Percentage
1	15	58
2	4	15
More than 2 branches	1	27
Total	26	100

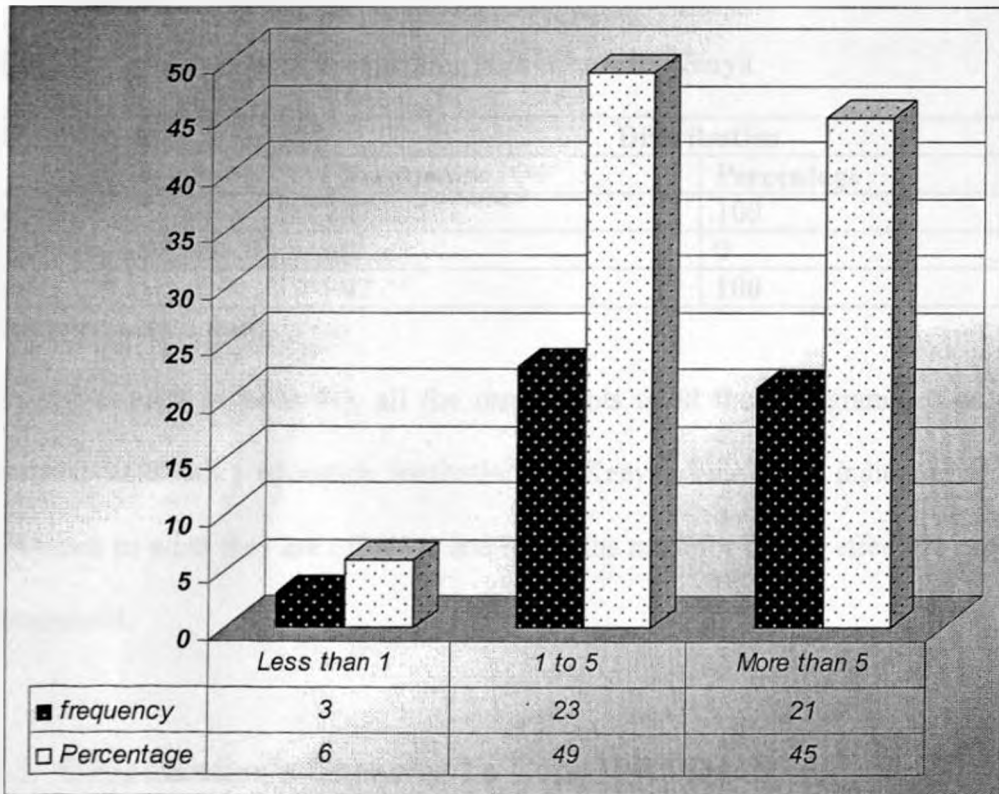
Source: research data

From the results in table 4-2, 58% of the institutions have one branch, 15% have two branches and 27% have more than two branches. The results indicate that most institutions have one branch, and thus managing capacity for them can be a challenge.

4.2.3 Experience Of The Respondents In The Institutions

The experience of the respondent in the institution will influence their decision to manage capacity and ability to participate in capacity decisions. The respondents were asked to indicate their years of experience in the institutions and the results are in chart 1.

Chart 1 Experience of respondents in institutions



Source: Research data

From the results in chart 1, 6% of the respondents had an experience of less than 1 year, 49% had an experience of 1-5 years and 45% had an experience of more than 5 years.

This is an indication that we are dealing with respondents who are well familiar with their institutions and hence in a position to know the capacity of the institutions very well, and thus able to make good decisions in effective capacity management.

4.2.4 Comparison Of Institutions' Programmes With Other Institutions In Kenya

For the institutions to offer good programmes, it is essential that they manage their effective capacity well. The respondents were asked to compare their institutions programmes with other education institutions in Kenya and the results are in table 4-3.

Table 4-3 Comparison of institutions with others in Kenya

Rate	Distribution	
	Frequency	Percentage
Good	47	100
Bad	0	0
Total	47	100

Source: research data

From the results in table 4-3, all the respondents rated their programmes as good compared with other education institutions in Kenya. This is an indicator of their confidence in what they are offering, and hence the need for proper effective capacity management.

4.2.5 Organization's Capacity To Cope With Demand

The demand for college education is on the increase globally due to increased rate of population growth (Ree & Kilemi, 1990). Institutions thus need to have enough capacity to meet the high demand. The respondents were asked to rate their organization's capacity to cope with demand and the results are in chart 2.

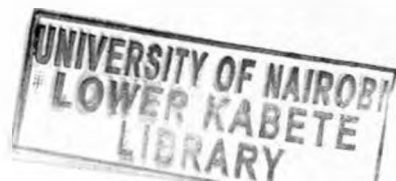
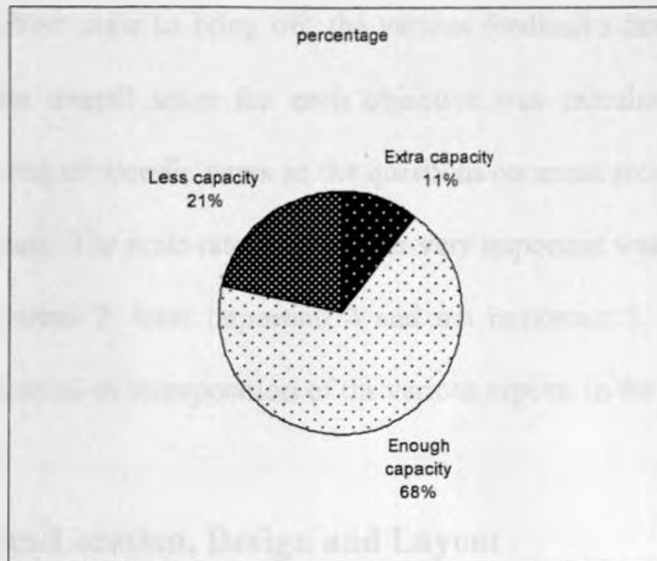


Chart 2 Organization's Capacity to Cope with Demand



Source: research data

Of the 47 respondents, 11% rated their institutions as having extra capacity, 68% have enough capacity and 21% have less capacity. None of them had no capacity, as indicated by chart 2. This implies that the institutions have room for improvement, to cater for the ever increasing demand.

4.3 Determinants of Effective Capacity

To determine effective capacity, there is need to maximize possible output; given product mix, scheduling difficulties, quality and machine maintenance, among others. Therefore, relevant factors that determine effective capacity need to be established for a business to maximize its output (Marshal and Tucker, 1992).

The descriptive study incorporated 30 participating tertiary education institutions, with a total of 60 respondents. The study sought to establish the determinants of effective capacity in tertiary education institutions in Kenya. The utilized research instrument was a questionnaire with mainly Likert scales in matrix questions. The

data from the Likert scales was analyzed both at overall score level and individual items in the Likert scale to bring out the various feedbacks from the participating institutions. The overall score for each objective was calculated to measure the institution's rating of specific items in the questions on mean score ranging from 1-5 on a five tier scale. The scale rated the item as very important was given a score of 1, important 2, neutral 3, least important 4 and not important 5. These scales were treated to imply level of incorporation of the various aspects in the items included.

4.3.1 Facilities Location, Design and Layout

The location, design and layout of the facility affect the effective capacity of the institution. The study sought to establish the extent to which the various elements of facilities design, location and layout were important to the institutions. The findings of the study were as presented in table 4-3-1.

Table 4-3-1 Facilities Location, Design and Layout

factor	Descriptive statistics	
	Mean	Std deviation
space utilization	1.40	0.57
Government legislation	1.57	0.76
proximity to customers	1.57	0.79
safety factors	1.68	0.72
ease of communication & support	1.77	0.82
ventilation & lighting	1.79	1.44
fast service delivery	2.13	1.03
minimizing total costs	2.34	1.09
Facility attractiveness	2.51	1.05
Overall mean	1.86	

Source: research data

The results in Table 4-3-1 show that space utilization, government legislation, proximity to customers, ease of communication and support and safety factors; ease of communication and support and ventilation and lighting were considered to be very important determinants of effective capacity (Mean=1). Fast service delivery, minimizing total costs and facility attractiveness were considered important determinants (Mean=2). This shows that facilities are considered very important as determinants of effective capacity in tertiary education institutions. They affirm Jacobs' (2008) proposition that; the design, location, layout and environment of the facility where production of goods or delivery of services is done are important components of a business's overall operations, both in terms of maximizing the effectiveness of the production process and meeting the needs of employees.

4.3.2 Service Factors

The output rate of a service determines its effective capacity, according to Rhyme (1998). This is depends on the service mix, uniformity and design. The study sought to establish the extent to which the various elements of service were important to the institutions. The findings of the study were as presented in table 4-3-2.

Table 4-3-2: Service Factors

Factor	Descriptive statistics	
	mean	standard deviation
Service Mix	2.64	0.94
uniformity of service	2.85	1.03
service design	3.04	1.44
Overall mean	2.29	

Source: research data

From the results in table 4-3-2 it was found that service mix and uniformity of service were considered important determinants (Mean=2). Service design was considered a

neutral determinant with a mean of 3.04. The relatively low overall mean (2.29) is an indication that these institutions fairly consider service factors as a determinant of effective capacity. This is because they customize their services so much to cope with the growing demand. It hence concurs with Rhyme's (1998) observation that customized services lead to less capacity.

4.3.3 Process Factors

The tasks or activities in a process of offering a service determine the outcome of the service offered (Hope, 1997). These activities therefore determine the capacity of the institution. The study sought to establish the extent to which the various elements of process were important to the institutions. The findings of the study were as presented in table 4-3-3

Table 4-3-3 Process factors

Factor	Descriptive statistics	
	Mean	Std deviation
process capability	1.51	0.54
process flexibility	1.85	0.82
process simplicity	2.79	1.43
Overall mean	2.05	

Source: research data

From the responses in table 4-3-3 it was found that process capability and process flexibility were considered to be very important determinants of effective capacity (Mean=1). Process simplicity was considered a neutral determinant with a mean of 2.79. This infers that process factors are important in effective capacity. This is in line with Namahias' (2001) proposition that process capability and flexibility contribute to more capacity.

4.3.4 Human Factors

Human capital is essential to the operation of any business. According to Scarborough (2003) human capital contributes to the success of the firm in attaining its objectives and greatly affects its effective capacity. The study sought to establish the extent to which the various human factors were important to the institutions. The findings of the study were as presented in table 4-3-4

Table 4-3-4 Human Factors

Factor	Descriptive Statistics	
	Mean	Std deviation
Labour turnover	1.68	0.83
Job content	1.79	0.62
Motivation	1.80	1.66
Absenteeism	1.83	0.68
Training and experience	1.85	1.17
Job design	1.96	0.87
Compensation	2.17	1.04
Learning rates	2.60	1.16
Overall mean	1.96	

Source: research data

From the responses in table 4-3-4, it was found to a very great extent that tertiary education institutions consider labour turnover, job content, motivation, absenteeism, training and experience job design as factors determining their human capital (Mean=1). Compensation and learning rates were considered important determinants (Mean=2). The results show high rating of human factors as determinants of effective capacity in tertiary education institutions. This affirms Foot's (2008) observation that; Knowledge is the firm's sole capability and is important to sustained capability to compete. She further concluded that organizational performance depends significantly on how the organization manages knowledge.

4.3.5 Policy Factors

Management policies regarding the operations of the business affect its capacity (Barnes, 2008). The study sought to establish the extent to which the various policy factors were important to the institutions. The findings of the study were as presented in table 4-3-5

Table 4-3-5 Policy Factors

	Descriptive statistics	
	mean	standard deviation
no. of working hours per week	1.80	0.84
performance measurement system	2.44	1.07
other capacity cushions	3.09	1.35
excess labour	3.17	1.45
Overall mean	2.63	

Source: research data

From the responses in table 4-3-5, number of working hours per week was considered to be a very important determinant of effective capacity (with a mean of 1.8). Performance measurement system was considered to be an important determinant of effective capacity (with a mean of 2.44). Excess labour and other capacity cushions were considered neutral determinants (Mean=3). The overall mean of 2.63 indicates that policy issues are important to the effective capacity of the institutions. Indeed the mean of 1.8 in number of working hours per week affirms Barnes' (2008) proposition that capacity is particularly affected by management policies with regard to the number of hours worked each week.

4.3.6 Operational Factors

The activities of the operations function are central to achieving efficiency and effectiveness of its capacity, as observed by Hill (2005). The study sought to establish

the extent to which the various operational factors were important to the institutions.

The findings of the study were presented in table 4-3-6

Table 4-3-6 Operational Factors

Factor	Descriptive Statistics	
	Mean	Std deviation
scheduling/timetable	1.36	0.69
managing equipment breakdowns	1.96	0.77
materials management	2.06	1.00
quality assurance	2.19	1.01
Overall mean	1.89	

Source: research data

From the results in table 4-3-6 it was found that scheduling/timetable and managing equipment breakdowns were considered to be very important determinants of effective capacity (Mean=1). Materials management was considered an important determinant (Mean=2.06). Quality assurance was considered a neutral determinant (Mean=3.81). The very high overall mean of 1.89 shows that this function is very important to the effective capacity of tertiary education institutions. It is in agreement with Dilworth’s (2002) observation that; the operations function is the ‘doing’ part of the organization and thus no organization can hope to be successful unless its operations are well managed. He also argued that the activities of the operations function are central to achieving efficiency and effectiveness.

4.3.7 Supply Chain Factors

Rahman (1998) in his study on the Theory of Constraints concluded that each of the players in the supply chain has its own capacity limits, and thus affects the effective capacity of the entire system. The study sought to establish the extent to which the

various supply chain factors were important to the institutions. The findings of the study were as presented in table 4-3-7

Table 4-3-7 Supply Chain Factors

Factor	Descriptive Statistics	
	Mean	Std deviation
matching of supply to demand	2.60	1.12
effective communication	2.62	1.55
trust among partners	2.83	1.29
supply chain visibility	3.34	1.33
performance metrics	3.45	1.39
Overall mean	2.97	

Source: research data

From the results in table 4-3-7, important determinants of effective capacity related to supply chains were found to be matching of supply to demand, effective communication and trust among partners (Mean=2). Supply chain visibility and performance metrics were considered neutral determinants (Mean=3). The results indicate that supply chain factors are considered as determinants of effective capacity in tertiary education institutions. This is in line with Rahman's (1998) proposition that; a firm's ability to use its own capacity is often directly dependent on capacity up and down the supply chain.

4.3.8 External Factors

Any business operates in an environment where there are definitely forces beyond its control, as indicated by Donald, (2006). The study sought to establish the extent to which the various external factors were important to the institutions. The findings of the study were as presented in table 4-3-8.

Table 4-3-8 External Factors

Factor	Descriptive Statistics	
	Mean	Std deviation
market service standards	1.57	0.71
safety regulations	2.11	0.90
stability of society & government	2.60	1.18
pollution control & environment standards	2.72	0.96
trade/workers unions	3.66	1.56
Overall mean	2.53	

Source: research data

From the results in table 4-3-8 it was found that market service standards was considered to be a very important determinant of effective capacity (with a mean of 1.57). Safety regulations, stability of society and government and pollution control and environment standards were considered important determinants (Mean=2). Trade/workers unions were considered to be a neutral determinant (with a mean of 3). These results show that external factors are important determinants of effective capacity. The high mean of 1.57 for market service standards affirm Klassen's (2002) statement that; the market sets the product/service standards, and the firm has to comply with that standard so as to remain competitive in the market.

4.3.9 Other Factors

There are other factors which affect capacity, but do not directly fit in any of the above named groups. The study sought to establish the extent to which other factors were important to the institutions. The findings of the study were as presented in table 4-3-9

Table 4-3-9 Other Factors

Factor	Descriptive statistics	
	Mean	Std deviation
total quality management	2.70	1.48
IT based information system	2.85	1.47
part time employees	3.02	1.52
business process reengineering	3.26	1.61
organizational learning	3.40	1.27
outsourcing	3.57	1.35
Overall mean	3.13	

Source: research data

From the results in table 4-3-9 it was found that total quality management and IT based information systems were considered an important determinants (with a mean of 2). Part-time employees, business process reengineering, organizational learning, and outsourcing and were considered to be neutral determinants (Mean=3). The results show that there is a relatively low extent to which these factors are considered as determinants of effective capacity. However, total quality management and IT based information system stands out in this group with a mean of 2. This affirms how needful it is for education institutions to offer good quality services, with IT as an enabler as proposed by Barnes (2008).

4.4 Relative Importance of the Determinants

The main determinants of effective capacity are facilities, product and service, process, human, policy, operational, supply chain and external factors (Thacker, 2009). These affect capacity in varying degrees. The second objective was to establish the relative importance of the determinants of effective capacity in tertiary education institutions. This was accomplished by listing the overall means of the determinants from tables 4-3-1 to 4-3-9 as shown below in table 4-4.

Table 4-4 Relative Importance of the Determinants

Determinant	Overall mean	Rank
Operational	1.89	1
Facilities	1.86	2
Human	1.96	3
Process	2.05	4
External	2.53	5
Policy	2.63	6
Service	2.84	7
Supply chain	2.97	8
Other factors	3.13	9

Source: research data

From the results in table 4-4 it was found that operational, facilities and human factors were considered very important with an overall mean of 1.89, 1.86 and 1.96 respectively. This sums up Barnes (2008) proposition that; effective capacity can be influenced by the age and condition of the machine, the skills, training, and flexibility of the workforce, and the availability of raw materials. Process, external, and policy factors were considered important with overall mean ranging between 36.1 and 31.7. Service, supply chain and other factors were considered neutral with an overall mean of 29.5, 28.8 and 27.8 respectively. These means are all above 23.5, which is the half of 47. Therefore, all the listed factors were confirmed to be determinants of effective capacity in tertiary education institutions at varying degrees.

An equation may be formed to show that effective capacity is a factor of all these determinants as shown below:

Let EC represent Effective capacity, OP operations factors, FA facilities factors, HC Human Factors, PR process factors, EX external Factors, PO policy factors, SE service factors, SC supply chain factors and OT other factors.

The equation would be written as

$$EC = \lambda_1 OP + \lambda_2 FA + \lambda_3 HC + \lambda_4 PR + \lambda_5 EX + \lambda_6 PO + \lambda_7 SE + \lambda_8 SC + \lambda_9 OT$$

Where λ_1 . λ_9 represent the overall means of operations up to other factors respectively.

Substituting the values would yield;

$$EC = 38.9OP + 38.7FA + 38HC + 36.1PR + 32.8EX + 31.7PO + 29.5SE + 28.8SC + 27.8OT$$

4.5 Summary of Data Analysis

This chapter presented the findings of the study based on the questionnaire returns. The chapter opened by looking at the background information moving on to present the detailed findings using responses to the questions on the study questionnaire. The next chapter will focus on the summary, conclusions and recommendations.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter focuses on three key areas, the summary of the important elements of the study; major conclusions drawn and the recommendation for improvement and for further studies. The study was a descriptive survey whose objectives were to establish the determinants of effective capacity at Tertiary Institutions in Kenya and to establish the relative importance of the determinants of effective capacity in tertiary educational institutions in Kenya.

5.2 Summary of Findings

The study confirmed that all the listed determinants of effective capacity were important in determining the effective capacity of tertiary education institutions in Kenya. The study also established three main factors as the very important determinants of effective capacity in tertiary education institutions in Kenya, which are; operational; facilities location, design and layout; and human factors. The overall score for each item was calculated to measure the institutions' rating of specific items in the questions on mean score ranging from 1-5 on a five tier scale.

From the study operational factors as a determinant of effective capacity affected tertiary education institutions and rated at an overall mean of 38.9. This score was a mean from the different aspects of operations that were measured on a five tier scale.

This reflected that the institutions highly valued their operations as an indicator of their effective capacity.

Second in importance from the study were facility factors, with an overall mean of 38.7. The score was a mean from the different aspects of facilities, such as, design, location and layout which were measured on a five tier scale. This reflected that the tertiary educational institutions consider their facilities as an important aspect of effective capacity.

Placed at number three in importance were human factor with an overall mean score of 38. This was a mean of various human factors which were measured on a five tier scale such as job content, job design, training and experience, motivation, compensation, learning rates, absenteeism and labour turnover. This was an indication that human factor were of great importance when considering the effective capacity of the institutions.

5.3 Conclusion

Based on the results from data analysis and findings of the research, the following conclusions were arrived at, based on the objectives of the study; Firstly, it was found that the determinants of effective capacity in tertiary education institutions in Kenya are operational, facilities, human, process, external, service. policy, supply chain and other factors. In each of these determinants are various factors unique to each that determine effective capacity.

Secondly, the determinants of effective capacity from most to least important were operational; facilities; and human; process; external; service; policy; supply chain and other factors in tertiary education institutions. The management of capacity in these institutions thus includes managing each of the determinants very carefully as they determine the effective capacity of these institutions. An institution that has established its specific determinants of effective capacity will carefully manage them, and this will lead to proper capacity management.

5.4 Recommendations

The following are recommendations from the study. All tertiary education institutions should establish their determinants of effective capacity and compare them with those of the industry so as not to be left out of the market. Further, they should seek to strengthen the management of these determinants so as to maximize their effective capacity. In managing capacity, the institutions should seek to know and fulfill the needs of their consumers since they are the ones the institutions exist to serve.

5.5 Limitations of the Study

The study had various limitations. To begin with, some of the target respondents were from very senior management and did not have enough time to fill the questionnaires as required and also to deliberate on some of the issues keenly especially when completing the Likert scale questions on the questionnaire. It was also realized that some of the responses might have had a level of bias to conceal the real situation in some institutions.

5.6 Suggestions for Further Research

This study was limited to tertiary education institutions in Kenya. Further research could be conducted in other education institutions such as universities and secondary schools. Other industries may also be researched.

The study was also limited to effective capacity. Research could be conducted on other aspects of capacity such as capacity utilization and capacity-quality relationship.

The study was a survey of many institutions. A case study of specific institutions in the education industry could be conducted.

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APPENDIX 1: QUESTIONNAIRE

This research is intended to establish the determinants of effective capacity management in tertiary education institutions in Kenya.

Please provide answers to the following questions by ticking against the most suitable alternative or giving narrative responses in the spaces provided.

Part 1: Background Information

1. Name of Institution _____

1.2 Which year was the institution established? _____

1.3 Number of branches _____

1.4 What is your position in the institution? _____

1.5 For how many years have you been in the institution? _____

Less than 1

1-5

More than 5

1.6 How do your institution's programmes compare with other institutions in Kenya?

Good

Bad

1.7 Please rate your department's or organization's capacity to cope with demand.

Has extra capacity

Has enough capacity

Has less capacity

Has no capacity at all

Part 2: Relative Importance of Determinants of Effective Capacity

To what extent do the following factors determine your effective capacity? Please indicate by ticking (Y) against the most appropriate factor on a scale of 1-5 in each of the sub-sections 2.1 to 2.9.

2.1 Facilities location, design and layout

Factor	Very important	Important	Neutral	Least important	Not important
Space utilization					
Ease of communication And support					
Ventilation and lighting					
Attractiveness					
Safety factors					
Fast service delivery					
Proximity to customers					
Minimizing total costs					
Government legislation					

2.2 Service factors

Factor	Very important	Important	Neutral	Least important	Not important
Service mix					
Service design					
Uniformity of service					

2.3 Process factors

Factor	Very important	Important	Neutral	Least important	Not important
Process capability					
Process flexibility					
Process simplicity					
Process uniformity					

2.4 Human Factors

Factor	Very important	Important	Neutral	Least important	Not important
Job content					
Job design					
Training and experience					
Motivation					
Compensation					
Learning rates					
Absenteeism					
Labour turnover					

2.5 Policy factors

Factor	Very important	Important	Neutral	Least important	Not important
No. of working hours per week					
Performance measurement systems					
Excess labour					
Other capacity cushions					

2.6 Operational factors

Factor	Very important	Important	Neutral	Least important	Not important
Scheduling					
Materials management					
Quality assurance					
Managing Equipment breakdowns					

2.7 Supply Chain Factors

Factor	Very important	Important	Neutral	Least important	Not important
Capacity of suppliers					
Capacity of distributors					
Capacity of consumers					

2.8 External Factors

Factor	Very important	Important	Neutral	Least important	Not important
Market Service standards					
Trade/workers unions					
Safety regulations					
Pollution control and environment standards					
Stability of society and government					

2.9 Other Factors

Factor	Very important	Important	Neutral	Least important	Not important
Business process Reengineering					
IT based information system					
Part time employees					
Outsourcing					
Organizational learning					
Total Quality Management					

2.10. What other factors determine the effective capacity of your organization?

Thank you very much for your cooperation and for filling this questionnaire.

APPENDIX 2: SAMPLE TERTIARY EDUCATION INSTITUTIONS

1. Augustana College
2. Bridge College of Professional Studies
3. Brilliant Institute of Professional Studies
4. Compuera Training Institute
5. Continental College of Business Studies
6. Cornerstone Training Institute
7. Dreamline College
8. Dima College
9. East African School of Management
10. Global Institute of Management and Commerce
11. Graffins College
12. Intraglobal Training Institute
13. Institute of Advanced Technology
14. Kenya College of Commerce and Hospitality
15. Kenya Institute of Management
16. Kiambu Institute of Business Studies
17. K.P.L.C. Technical Training Institute
18. Metropolitan Institute of Business Studies
19. Nairobi Aviation College
20. Nairobi Institute of Business Studies
21. Nairobi Institute of Technology
22. Nairobi Technical Training Institute
23. Railways Training Institute
24. Regional Training Institute
25. Skynet Business College
26. Star College of Management Studies
27. Thika Institute of Business Studies
28. Thika Institute of Technology
29. Vision Institute of Professionals
30. Zetech College

APPENDIX 3: LETTER OF INTRODUCTION



UNIVERSITY OF NAIROBI
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DATE 27/07/2011

TO WHOM IT MAY CONCERN

The bearer of this letter JOYCE LIZA NJUTHE

Registration No: DEI/170548/2008

is a Master of Business Administration (MBA) student of the University of Nairobi.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate if you assist him/her by allowing him/her to collect data in your organization for the research.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

DR. W.N. IRAKI
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