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CHALLENGES OF CAPACITY MANAGEMENT IN PUBLIC UNIVERSITIES IN KENYA.

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ABSTRACT

Every organization faces the challenge of managing its capacity to effectively satisfy demand. Due to the high costs associated with facilities, equipment, and labor, organization are confronted with the challenge of meeting demand with minimal resources. The increase in student enrolment, with some universities registering more self-sponsored students than the government-sponsored students who are selected through the Kenya Universities and Colleges Central Placement Service (KUCCPS), has also affected the capacity of the universities. As enrollments continued to increase in all the public universities the government has not increased their funding, and hence complicating capacities issues.

This study sought to find out the challenges of capacity management in the 31 public universities and how the universities are coping with such challenges and make suggestions on long term solutions to such challenges. The study took a sample on one hundred and fifty respondents that comprised of ten members of staff and five students from a sample of ten public universities. Data was collected using a structured questionnaire which was delivered to the respondents who filled it at their own convenient time for later collection. Also a face to face interview was conducted on a few selected respondents to get some clarifications and further explanations.

The data was analyzed using mainly descriptive statistics that included the arithmetic mean and percentages and both were used to give the picture the challenges of capacity management in public universities in Kenya. The study concluded that the student accommodation in the hostels, sitting capacity in the library and financial resources are the most challenging issues in capacity management in public universities in Kenya. The study recommends that public universities should address the challenges so that all the public universities can have some standardization in their service delivery so that students can choose any public university of their choice.

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1.0 INTRODUCTION

Every organization faces the challenge of managing capacity. Due to the high costs associated with facilities, equipment, and labor, organization are confronted with the challenge of meeting demand with minimal resources. Ideally, an organization's capacity would match their demand requirements exactly.

The world is now facing new and complex problems demanding new solutions. The emerging problems include: rapid urbanization, water scarcity, pandemics, geo-political tensions, changing climate, conflicts and terrorism. With a clear framework and planning, the governments are expected to ensure that universities undertake research and tailor their academic programmes to address these problems. However, since the mid 1980s government funding to public universities has declined causing them to have an unsteady and stressful financial environment. The increase in student enrolment, with some universities registering more self-sponsored students than the government-sponsored students who are selected through the, has also affected the capacity of the universities. As enrollments continued to increase Kenya Universities and Colleges Central Placement Service (KUCCPS) in all the public universities the government not increased their funding, and hence complicating capacities.

Services account for a growing percentage of the gross national output of most countries. As such, service industries are maturing and have become more competitive, and there is a growing need to increase efficiency, productivity and competitiveness. The capacity of service firms has to be managed to achieve maximum and optimum utilization at all times, if possible. Despite its importance, there has been a lack of attention devoted to the study of service capacity in the academic literature. Managers in service firms face a complex and difficult task with regard to capacity management, and have less than adequate information to assist them. There seems to be a divergence between what companies should do, according to academic literature, and what they are actually doing. This divergence seems to occur, because the literature often ignores the role of strategy when dealing with capacity issues. As competition intensifies many service firms have learned to survive by creating and innovating strategies with regard to capacity [9]

The business environment has never been more challenging than it is right now. The speed of change in the marketplace is creating stress on corporations to respond quickly and effectively. The foundation that is required to react to dynamic changes in supply and demand is based on understanding your supply chain's capacities. Understanding and then building the infrastructure

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that provides the needed flexibility and speed requires an in-depth understanding of how capacity impacts your business.

Academic resource planning is a highly complex administrative procedure based on extensive analysis of the entire data related to the educational framework, such as teaching resources, offered degrees, course structure and curricula, student numbers and other factors. The emergence of advanced information technologies has altered the operational environment of universities world-wide offering them an opportunity to move on towards more systematic and efficient management of their assets.

1.1 Capacity management

The impact of capacity management is felt throughout the organization, within every element of the supply chain. Capacity planning is the process of determining the production capacity needed by an organization to meet changing demands for its products. In the context of capacity planning, "capacity" is the maximum amount of work that an organization is capable of completing in a given period. The phrase is also used in business computing as a synonym for Capacity Management.

A discrepancy between the capacity of an organization and the demands of its customers results in inefficiency, either in under-utilized resources or unfulfilled customers. The goal of capacity planning is to minimize this discrepancy. Demand for an organization's capacity varies based on changes in production output, such as increasing or decreasing the production quantity of an existing product, or producing new products. Better utilization of existing capacity can be accomplished through improvements in overall equipment effectiveness. Capacity can be increased through introducing new techniques, equipment and materials, increasing the number of workers or machines, increasing the number of shifts, or acquiring additional production facilities.

Capacity of a service firm is ``the highest quantity of output possible in a given time period with a predefined level of staffing, facilities and equipment". Capacity among service firms has one commonality. For each day a service is not put to profitable use, it cannot be saved. This perishability suggests a need for careful planning and management, as idle capacity due to slack demand, as well as turning away customers due to insufficient capacity, are serious problems critical to the success of many service firms.

1.2 Public universities in Kenya

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The history of university education in Kenya can be traced back to Makerere University in Uganda, founded in 1922 during British colonial rule as a technical college for African students from the East African countries of Uganda, Kenya and Tanganyika. The college offered post-School Certificate courses in various fields including teacher training, carpentry, building technology, motor mechanics, medical care, agriculture and veterinary services and in 1949 the Makerere University Act was passed, giving the institution the legal status of a university. Makerere was thus established as the University of East Africa that was to offer degrees of the University of London, and admitted its first undergraduate students in 1950 [8].

The University education in Kenya is under the Higher Education Directorate in the Ministry of higher of Education which co-ordinates the developmental functions of the various universities. At the same time, the Commission for Higher Education (CHE) co-ordinates higher education through registration, categorization, standardization, validation, harmonization and supervision of universities. The role of university education is to produce a cadre of highly qualified manpower equipped with requisite skills. The society looks up to universities to take lead in generating the required knowledge, supply capable human capital and appropriate technology, and innovation needed to meet this goal. It is for this reason that the expansion and improvement of higher education in general, and universities in particular has always remained a top priority of the government of the Republic of Kenya.

University education in Kenya began in 1963 with just 571 students enrolled in Nairobi University College. Since then, the system has undergone some commendable expansion, and by 1998 there were a total of six public universities and 18 private universities with varying degrees of recognition in the country. There are now 31 public universities with a total student population of 769,000 for all the universities and colleges in the country, according to the 2016 statistics.The admission of students to the regular programmes of public universities is done through the Kenya Universities and Colleges Central Placement Service (KUCCPS), while self–sponsored streams of the public universities and private universities independently admit qualified students into their programmes. The number of qualified applicants to Kenya's national universities has been rising, leading to increasing enrolments in Kenya's universities.

There has been an unprecedented increase in student enrolment, with some universities registering more self-sponsored students than the government-sponsored students who are selected through the. Kenya Universities and Colleges Central Placement Service (KUCCPS). However, despite this expansion, and as a result of inadequate government funding, these institutions are facing demand-related challenges especially in terms of access and equity; relevance and quality; science and technology; and management and global marketability. They face a deficit in terms of quantity and quality of our human resources thus raising a number of

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concerns. Kenya's tertiary education and training, especially in terms of adoption of modern technology, innovation to transform the knowledge generated into final products and equipping the graduates with the desired skills necessary to be effective as productive workers may not be effective.

With the establishment of the 8-4-4-system, university education takes a period of four years to complete, however there are schools such as medicine and law that take an additional year or two. In addition to the universities and their constituent campuses, higher education in Kenya also includes polytechnics, institutes of science and technology and diploma level teacher training colleges. Notwithstanding the expansion in the past several years, the capacity of the higher education sector in Kenya is still limited and accommodates only 7.5 percent of students graduating from secondary schools, and 2 percent of the expected age cohort. Between 1990 and 2000, it was reported that 180,000 of the students who attained the minimum entry qualification failed to gain admission to public universities. Therefore, access to higher education in Kenya is extremely competitive and students must earn a grade point average on the Kenya Certificate of Secondary Education significantly over and beyond the minimum eligibility requirement.

1.3 Statement of the Problem

An issue of capacity in the public universities is an agenda of policy makers at higher education level. Considering the huge public and private investment in university education, there is an urgent need to evaluate how effectively the investment is being utilized by examining the quality of the educational infrastructure, the cadre of qualified tutors and other resources in place, and the quality of teaching and learning. Public universities in Kenya face many challenges such as: inadequate funding especially for research and development, quality and relevance, inadequate use of ICT, lack of a unified accreditation system, un-harmonized legal frameworks, inadequate management capacity, drug and substance abuse. Hence there is need to study the capacity problem and make recommendations for improvement.

Several studies have been done on problems of university education in Kenya. [7] did a study on *The World of Private Universities: The Experience of Kenya*. [7] did another study on Public and private universities in Kenya.. This study therefore is intended to bridge up the gap on the challenges of management of capacity in public universities in Kenya. This study is intended to answer the research questions, "What are challenges of capacity management of public universities in Kenya?"

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2.0 LITERATURE REVIEW

2.1 Capacity Management

Capacity development is defined as "the creation of an enabling environment with appropriate policy and legal frameworks, institutional development, including community participation, human resources development and strengthening of managerial systems[13] As the definition implies, a variety of initiatives and actions contribute to the development, strengthening, and maintenance of capacity at the individual level, at organizational levels, and within the wider environment [2].

Whilst this complexity must be recognized, education and training continue to be a key element of capacity development approaches [4]. Organizations have increasingly been investing in developing their human resources through training programmes that are often tailored to meet the needs of these organizations [4] . Where such initiatives also involve networking or twinning, capacity can be further developed and maintained through the process of sharing knowledge and experience [2].

Capacity management in service operations is a testing activity for operations managers because the nature of the service delivery process and the involvement of the customers in the process restrict the options open for controlling the process of matching supply with demand across the whole service delivery system. The four general options for operational control are altering the capacity, holding inventory in anticipation of demand, requiring customers to wait for the service, or influencing demand in other ways. In service delivery there is not the possibility of producing the complete service package in advance of demand and holding it as an inventory.

This real time element of service production makes the matching of supply and demand very important, particularly in capacity-constrained services, such as airlines, hotels, and professional services, when the profitability of the operation is closely linked to the use of the current capacity and the prices charged. Capacity management is the ability to balance demand from customers and the capability of the service delivery system to satisfy the demand. These places emphasis on understanding first, the nature of demand by forecasting [1] and second, the options for managing capacity to meet the expected demand. [10] suggested two basic strategies for managing capacity in services, namely, the *level* strategy and the *chase* strategy. The former is applicable where capacity is limited and hence the focus is on influencing demand to be in line with capacity, and the latter chase strategy being possible when supply can be changed to keep in line with demand. Consequently operations managers must understand the composition of their capacity, the degree to which it can be changed, and the speed of reaction [10], and the costs involved [2]

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2.2 Capacity management; Theoretical review

A term frequently used in manufacturing, capacity planning is excess capacity or underutilized capacity. From an academic perspective, the term most commonly used is undersubscribed programs. Undersubscribed programs equate to excess capacity in certain degree programs. Other programs could be oversubscribed, indicating a lack of capacity. Although oversubscribed capacity may be interpreted as a positive, in reality, oversubscribed programs could be taxing to the institution as well. This is only one aspect of capacity planning.

[12] Defines capacity as the upper limit or ceiling on the load that an operating unit can handle, with the operating unit defined as plant, department, machine, store, or worker. Determinants of effective capacity include several factors: facilities, product/services, processes, human considerations, operations, and external sources [12]. From an institution of higher education perspective, capacity could be defined as the upper limit or ceiling that an operating unit can handle, with the operating unit defined as an academic department, classroom space, laboratory availability, computer laboratory availability, and faculty availability. The determinants of effective capacity for an institution of higher education parallel those of a manufacturing/ production operation and may be approached in a similar manner. Until a new theory is applied, an institution of higher education will experience difficulty in justifying the application of an unproven technique. It is important to identify the transferability of theory from another industry. The purpose of this article is to discuss the transferability of capacity planning theory and application documented in manufacturing and service organization research to institutions of higher education.

2.3 Capacity management; Theoretical Framework

Because institutions of higher education have operated on the premise of funding from government and outside sources, in addition to tuition, there have not been the external pressures to be accountable. As the funds become less available and more restrictive, senior administrators need to focus on capacity planning issues. In the strategic planning process, senior administrators need to integrate capacity planning issues associated with capital assets, operating expenses, and human resources. More specifically, the key focus for the strategic planning is the overall operational plan, where there appears to be shortfalls in operating budgets to maintain and sustain existing facilities. Institutions of higher education have focused on strategic planning issues for many years but have been forced to operate with more limited funding while expanding building capacity. Planning for capacity in an institution of higher education is very similar to manufacturing and service sectors. This is because the demand for services and type of

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services provided is in a constant state of flux. These issues can be addressed specifically for an institution of higher education.

It is important to first start with the foundation for capacity planning strategy, which is founded on the premise of the operational plan. The operational plan is an element of the much larger Strategic Plan. In the development of the theoretical basis for capacity planning issues associated with Institutions of Higher Education, the Operational Plan component of the Strategic Plan needs to be expanded. There are similarities and differences that should be recognized regarding the operational plan. In some respect, manufacturing and service organizations can anticipate the changing product or service offerings and adjust their plans accordingly. This would be based on their continuing research and development of future products and services. In an institution of higher education, research and development occurs on a regular basis.

However, there may be a disconnect between the researcher, academic department, and university administrators that represents a lag in the recognized need for change in course and degree offerings and the implementation of these changes. Because of the profit motive of a private manufacturer or service organization, they perceive the need to address the change in market focus much more quickly than an institution of higher education.

Politics and layers of bureaucrats sometimes lead to late-to-market new programs and course offerings, missing the opportunities to address issues associated with operational planning. Also, some degree programs are driven by donor support and not necessarily by market driven demand, thereby adding operational expense that affects and benefits only a small minority faction. The many aspects of operational plans are important to institutions of higher education.
The primary focus will be on the capacity plan component. Even though each of the operational plan components appears on the same line, this is no way indicative of their priority or possible interrelationships to each other. In some cases, components of the capacity plan could also impact other elements of the operational plan. The capacity plan component of the operational plan has been expanded to show key elements of capacity planning.

2.4 Capacity Planning in Institutions for Higher Education

In manufacturing and nonmanufacturing capacity planning, there are numerous issues affecting an institution of higher education. Several issues reviewed in the literature include space planning, management of capital assets, renovation versus expansion, overhead/maintenance costs, office space, and strategic planning. Many issues are similar to those experienced by the service sector (nonmanufacturing).

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Although institutions of higher education receive donations for capital assets, such as buildings, equipment, and other hardware, these donations typically do not address the issues of maintenance or overhead costs (direct or indirect) associated with the capital investment. The decision to build a new structure may override the maintenance/updating of existing structures because of the availability of funding. This poses issues of outdated but usable buildings. Space becomes an issue when an institution chooses to renovate a facility versus building a new facility. Assuming space is already scarce, and then temporary relocation poses taxing issues on the other areas that are indirectly affected by the renovation activities. Another decision many universities have experienced is whether renovate versus new building construction. When building and renovation is not an option, managing scarce space becomes an issue. [1] focus on the allocation of faculty office space and scarcity of choice locations. This is a similar problem as experienced in the service sector where office space is an ongoing problem for certain industries. They focused on the failing operational strategies in academic management coupled with the lack of understanding customer requirements and institutional capabilities. Major capacity planning related issues focus on scheduling, course offering management, link between overall strategic plan and execution of operational strategies, and flexible planning. The issues in an institution of higher education have similarities with those encountered in a manufacturing setting and service sector. These are further developed in the theoretical framework presented in the remaining discussion.

2.5 Capacity in Institutions of Higher Education: Lessons Learned from Industry

There is minimal application of capacity plan management used in an institution of higher education. The identified capacity plan components are in existence but may not be linked as in this theory formulation. Many of the benefits obtained from other industries are transferable to higher education and should be addressed in the strategic planning process. Ultimately, capacity planning is focused on output from plant facilities and suppliers. From the vantage point of higher education, classrooms and faculty are comparable to plant facilities and suppliers. If there is less than adequate capacity, classrooms or available faculty, then a shortage exists or an oversubscription of a program occurs. Capacity is calculated based on the number of shifts, hours in a shift, and days of operation a manufacturing plant operates.

Some institutions of higher education offering courses during the day and evening are now expanding their capacity by offering courses on the weekend. Other institutions focus primarily on the traditional student and offer courses during the day with a limited offering of weeknight and/or weekend courses. Maximum capacity is impacted by how capacity is defined by the institution of higher education. Capacity calculations are based upon existing and available capacity without further expansion of buildings or temporary lease/rent at additional

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existing/new locations, in other words, from a short-term perspective. Another factor to consider in the capacity calculations for an institution of higher education is the effect of web-based courses. This could cause excess capacity and have an impact on future buildings and classroom modifications.

2.6 Buildings, Technology and Equipment

Decisions regarding buildings generally are classified as long-term planning horizon issues. It may be possible, from a short-term perspective, to convert existing office or conference space into a temporary classroom if all possible capacity is exhausted. Temporary classrooms have also been constructed by using prefabricated buildings and trailers as a short-term alternative to solving the space problem. Also, renting/leasing space at an off-site facility is another option. The majority of capacity planning issues associated with a building need to be included within the long-term capacity planning . Industrial companies may temporarily seek space or outsource to meet their needs. They may also seek a temporary arrangement by using prefabricated buildings.

Institutions of higher education face another issue not experienced by industry. If a building has classrooms that are out-of-date but still provide space, the building is considered in the development of the capacity plan. Typically, administrators and major fundraisers have an easier time seeking funding for a new building instead of major renovations to an existing building. New buildings are named after the highest donor with other major donors having their name associated with a classroom or laboratory. Since older buildings and existing classrooms may already be named after a significant donor or major contributor to the institution, there appears to be a lack of interest for parties to upgrade existing buildings.

Also, major donors may have a specific interest in a certain degree program or research area because of its current popularity in industry. As the industry focus changes, the building needs change, and the building becomes obsolete. Consequently, there may be sufficient classroom and laboratory capacity, but inadequate for the needs of the institution. If the institution chooses to increase its web-based course offerings, the result could be excess capacity. In the case of excess capacity, when a need arises to integrate educational and instructional technology into the classrooms or laboratories, public institutions may have difficulty in justifying funding from government sources. The funding sources may only look at capacity (space) without considering the match of required physical resources to offer cutting edge technology in the classroom and laboratory facilities.

Each faculty and researcher has wants and needs regarding technology/equipment requirements for classrooms, student laboratories, and research laboratories. The issues associated with

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technology/equipment are two-fold: existing equipment and desired new equipment. In a manufacturing scenario, existing equipment is often used until it breaks or becomes obsolete. This is often the scenario in higher education. Antiquated equipment is often used because funding is not available to purchase more current equipment. A perfect example is the computer technology used by many faculties in their office. Often replacement of equipment may not be an issue linked to seniority but the ability to manipulate the system to locate funding or to find an outside funding source. Existing equipment may be in short supply. For example, a limited number of projection units used in conjunction with laptop computers are in limited supply, posing a finite scheduling problem [12].

When a manufacturer identifies a piece of equipment as obsolete, it will sell the equipment to a scrap dealer, rebuild the piece of equipment, or transfer to a surplus equipment warehouse. In higher education, the equipment is retained, taking up space in a laboratory or storage warehouse and wasting precious space. New equipment should have flexibility, adaptability, and efficiency. These are requirements provided to equipment builders. However, equipment acquisition is sometimes determined by what a company is willing to donate and whether the institution accepts the equipment. Institutions are hesitant to refuse a gift even if they do not need or want it because the donor may decide to limit future donations or not donate again. Some equipment collects dust and is not productively used by researchers, faculty, or students.

New equipment desired by faculty and researchers is funded by external sources, either government entities or private donors, and may be subjective to a lengthy acquisition/proposal process, cost limitations, or other restrictions. If the faculty or researcher has an opportunity to request new equipment, they should use the same criteria now used by manufacturers, flexibility and adaptability to extend the life. Another aspect is maintenance. Although maintenance is an important issue and impacts the life of a piece of equipment, it is not considered in this discussion of capacity planning.

2.7 Lecture Rooms Utilization and Program Subscription

Many classroom buildings have outdated classroom setups and have not been modified from traditional mass seating. As faculty try to integrate a team approach, there are inadequate classroom setups allowing for roundtable or team discussions. In many instances, it may appear that adequate classroom space is available. In reality, the type of classroom required, size of classroom, and instructional technology may not represent the appropriate mix needed for the course offerings.

If excess capacity exists, the institution may rent the space during non-peak periods. For example, in a traditional day institution, the classrooms could be rented at night. Or in a campus

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where the bulk of the students attend in the evening, often in a satellite location, the space could be rented for meetings, conferences, and seminars during the day. Like manufacturing, when adding new classroom space, the space should be flexible, adaptable, and efficient for its intended use. New classrooms should come equipped with multimedia technology and appropriate seating to accommodate or adaptable to a multitude of requirements and not just be a bare bones room with standard student desk seating.

Program subscription requires a balance of qualified full-time faculty supported by adjunct faculty, as there are changes in demands for certain programs. There is hesitancy on the part of the academic department as well as administration to increase the number of full-time faculty because of changing budgetary conditions. From a full-time faculty viewpoint, too many adjunct faculties impede the continuity of the department activities. Lessons learned from manufacturing may be using a level demand strategy for full-time faculty and a chase demand strategy for adjunct faculty [1] .

A level demand strategy would mean keeping the ranks of full-time faculty to a stable level without fluctuating for changes in demand for classes. This would mean during periods of low enrollment there could be excess faculty capacity. When excess faculty capacity occurs, it may be recommended to encourage tenured faculty to take a sabbatical. However, this would require advanced planning to have an understanding of the drop in enrollment levels, indicating when to encourage sabbaticals. The chase demand strategy means that additional adjunct faculty, possessing the necessary training and skills for the courses offered, would be employed when enrollment goes beyond what the full-time faculty can support. Determining the adequate level of full-time faculty needs to be a joint decision between the faculty and administration. Although on the surface to use a chase strategy for the adjunct faculty would be viable, institutions located in remote locations may not have the pool of resources available to take advantage of this strategy for adjuncts.

Level strategies are used in manufacturing to maintain continuity of the workforce. When a level strategy is used, there may be excess inventories when demand is less than supply. It is anticipated that these inventory levels would be depleted when the demand exceeds the supply. A chase strategy is used in manufacturing by keeping a constant workforce but requiring overtime when demand exceeds normal production requirements or could also be supported by subcontracting work. Faculty could use a chase strategy by allowing for course overloads. In manufacturing, service, and institutions of higher education, a chase strategy could be prohibited because of union agreements regarding overtime hours worked during a given time period or prohibition to teach course overloads.

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In undersubscribed programs, there is the issue of excess faculty, in many cases, with tenure. The reasons the program is undersubscribed could be due to a lack of interest from industry for students in this field or poor marketing on the part of the academic unit. This is equated to excess capacity in a manufacturing environment and poses the same issue, how do we attract more customers (students) to purchase the products (subscribe to our programs)? It may be an issue of not having an established reputation or industries not being aware that the degree program exists and does not typically recruit students from the institution.

2.8 Course Offerings and Scheduling

Course offerings are based on several factors: faculty availability, accreditation limitations on the number of credit hours taught by a faculty member in a year, classroom availability, class size limitations, and demand for particular programs, lab availability, and number of graduate teaching assistants. Course offerings are also linked to undersubscribed or oversubscribed programs. In undersubscribed programs, courses may be cancelled due to low enrollments. In an oversubscribed program, there may be insufficient sections to meet the student demands. The most common issue linked to manufacturing is not meeting customer demand because of insufficient capacity. In undersubscribed programs, the comparable issue in manufacturing would be excess capacity. Like manufacturing where there is no longer a demand for a certain product, institutions of higher education need to recognize when there is no longer a need for certain degree programs. Although an institution of higher education may have a reputation for a particular program, if there is little interest from students or industry, they should discontinue the program.

There are several aspects of scheduling to consider. They fall into three categories: student scheduling, space availability, and faculty assignment. Because there is limited space, finite capacity scheduling guidelines traditionally used in scheduling apply. Finite means the resources have been maximized. For example, if classes are taught seven days a week, days and evening, there is no more capacity available without building new buildings. Finite capacity scheduling, as a means to improve capacity planning in a manufacturing environment, is relevant to scheduling in institutions of higher education. This is particularly relevant during peak periods. Peak periods in a traditional day offering institution may be from 10 am to 3 pm because students do not want to get up early or attend late in the day. For working students attending graduate school, the peak period would be 6 pm - 10 pm, Monday through Friday.

Traditional manufacturing scheduling rules play a role in a finite loading environment. Some of these rules, often referred to as dispatching rules [12]. are being used by institutions of higher education. First in, first out (FIFO) may be referred to as first come, first served in higher

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education. This also appears to be one of the most common dispatching rules used by other service operations, for example, banking fast-food restaurants, and movie tickets. When the capacity for a course is predetermined, when the enrollment for the course is met, generally another enrollment is not accepted through the normal channels.

Another scheduling rule that might be applicable is known as highest-value job first.. A scheduling rule used by some institutions allows for upper classman by rank to register before the lower classman. For example, if a senior was graduating, they would have priority scheduling because of their higher class standing (higher value/rank). Other dispatching rules are not applicable or transferable to student scheduling. An additional aspect of scheduling can be categorized as space availability. Space availability issues are associated with time slots, classroom/lab availability, and location. The space allocation is based on priority rules established in conjunction with the administrator responsible for overseeing academic activities within the institution. Office space may be obtained through auctions ([1] or seniority.

Priority rules may by importance or size of the degree program (value), location of department offering course, level of program (graduate versus undergraduate), or need for specific instructional technology permanently located in a room. Shortages exist for certain classrooms with the latest instructional technology. In some institutions, a lottery system may be used. For those departments with low priority, whatever is left is what they are allocated. In the future for some courses, space scheduling will not be an issue. Courses offered over the Internet do not require space or time allocation issues but still need to be scheduled. Some courses may not be able to be offered over the Internet because of the equipment laboratory requirements and hands-on application.

The final issue of scheduling is the assignment of faculty to the classes. This could also be compared to the transportation/location problems found in operations management/ research. There cannot be more courses than faculty available to teach assuming a finite number. In a transportation/assignment problem we may have dummy variables. Dummy variables could be used if a faculty member is in an undersubscribed program. The dummy variable would be a nonexistent course the faculty is assigned to.

3. RESEARCH METHODOLOGY

The researcher collected data using a structured questionnaire which was delivered to the respondents who filled the questionnaire for later collection. This method was used because it is cheaper, more convenient and gave the respondents enough time to answer the questions. Also a face to face interview was conducted on a few selected respondents to get some clarifications

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and further explanations. The researcher also made a follow up by personally visiting respondents to increase the number of returned questionnaires.

Data was collected from a sample of five universities within the city of Nairobi and another five universities that are situated in the rural areas. A sample of two members of staff in Accommodation in Hostels were interviewed on bed capacity, Toilets and bathroom capacity, two members of staff in the Library on student sitting capacity and book availability, two members of staff in the dinning capacity in terms of sitting capacity, plates, Knives, forks and spoons, two members of staff in the Lecture rooms in terms of sitting capacity, Laboratories and availability of lecturing staff and two members of staff in the Finance department in terms of availability financial resources to increase capacity. Data was collected from a sample of five students selected at random from each University. This makes a total of ten members of staff and five students from each university bringing the sample size to one hundred and fifty.

All the returned questionnaires were thoroughly checked for any inconsistencies and errors which may have occurred during the process of data collection. Any such errors were corrected before analysis was done. The data was tabulated for analysis which was mainly descriptive statistics. Tables were used in summarizing the analyzed data and hence assisted in answering the research questions. The descriptive statistics mainly included the averages that were used to give the picture the challenges of capacity management in public universities in Kenya.

4. RESULTS AND RECOMMENDATIONS OF THE STUDY

The study found that lack of financial resources, lack of enough student accommodation in the hostels and sitting capacity and reading materials in the library are the most challenging capacity issues in public universities in Kenya. Financial resources are one of the most important assets in any organization. This is because such a resource is the determinant of the other resources. Hence this is the one the most challenging issue in capacity management in universities. The other issues which include student accommodation, sitting capacity and reading materials in the library emanate from the financial recourses.

Student accommodation in public universities used to determine the number of students to be admitted into any university in Kenya. With the ever increasing student admissions, public universities are not able to cope with the accommodation within the universities and hence capacity challenge. In some other universities student accommodation in the hostels is below five percentage of the student population. In such circumstances students are forced to reside outside the university premises which expose them to other risks like security.

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The accommodation situation is dire. There are a combined 280,000 bed spaces in universities and colleges in the country, compared with a student population of 769,000, according to the latest statistics. And most of the admissions are self-sponsored students, who provide the much-needed resources for the development and sustenance of the institutions' operations. One university within Nairobi city has just two hostels, one for men in and one for women with a combined 1,000 rooms, while the student population is more than 18,600. Those who are lucky enough to get the rooms pay Sh7,200 per semester. Another University has more than 22,000 students not living on campus seek accommodation in the crowded estates near the university. Outside Nairobi another University is facing a major crisis with more than 5,300 students seeking accommodation in the already congested town.

The other challenge is sitting capacity and reading materials in the library and in the Lecture halls. In almost all the public universities, the sitting capacity in the library is below five percent of the student population and hence a serious challenge. Inadequate and uncomfortable seats for students and academic staff respectively may imply that some students had to squeeze into the available space thereby decreasing the level of comfort and hastening the onset of fatigue. The increased numbers of students have overstretched available resources in public universities.

For effective intellectual, cultural, and technical development of students enrolled in courses and programs to take place, adequate provision of library and information resources is necessary. The academic staff too needs adequate library resource for effective delivery of the curriculum to their students. Students were the most disadvantaged on all aspects of adequacy of study materials and online resources. The situation for the academic on the same appears just slightly better than that of the students, though it still raises concerns. A lot needs to be done to improve the quantity of library resources to adequately meet the needs of the students and academic staff in Kenyan public universities. This challenge is not easy to solve and hence will take a very long time to sort out.

The conditions of lecture halls in many universities need urgent improvement. Apart from broken chairs and poorly maintained toilet facilities, a number of students indicated that some lecture halls were dingy and leaked during the rainy season. Again, when it rained, lectures had to stop because some halls had iron sheet roofs and no ceilings. Other students observed that some lecture halls had potholes on the floor and lacked adequate ventilation. The broken down furniture was also viewed as risking the students with injury. At other universities, due to insufficient number of chairs students had to carry seats from one lecture to another, which was cumbersome. Lack of space in the lecture halls provided a challenge to the students as well. Some observed that they had to scramble to lectures in order to secure places. At times the scramble for space could result into scuffles, which were embarrassing. Those unable to secure

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places either missed classes or stood during lectures. In some course units, you have one lecturer teaching more than 1,000 students, so he or she has to use a microphone. This raises the question, can quality be guaranteed in such circumstances? Perhaps, that is why universities are churning out "half-baked" graduates. Overcrowding in lecture halls is very common in public universities in Kenya. Poor remuneration of staff, workload and inadequacy of staff were some of the challenges facing public universities management.

The study concluded that financial resources, student accommodation in the hostels and sitting capacity in the library are the most challenging issues in capacity management in public universities in Kenya. Financial resources determine the other resources in any organization. This challenge comes about because public universities are partly financed by the government and as such support has been declining for various reasons. As a result of that such resources have been decreasing and hence a serious challenge in capacity management.

This study recommends that public universities in Kenya should address the challenges so that all the public universities can have some standardization in their service delivery so that students can choose any public university of their choice. Student admission should not be based on the bed capacity of the hostels in public universities. Universities should liaise with private developers who can construct hostels in secure places for students to lease at reasonable rates.

The government should give some funds to the public universities to be used in addressing those challenges. This applies more especially to the newly upgraded institutions which experience many of the challenges mentioned above. At the same time public universities should start some income generating activities so that they can find some methods of generation extra funds outside government financing. Such activities should include both academic and non academic activities so that they can become self reliant like private universities. The government should formulate a policy on accommodation of students in public universities so that all universities can accommodate some percentage of the students and also give standard service.

More lecturers and non-teaching staff should be recruited to match the increase in student enrolment and improve lecturers‟ incentive system. Each university should have a substantive number of highly qualified academic staff at the centre of its teaching, research and supervision levels. This should be demonstrated in the numbers of qualified academic staff with a Doctor of Philosophy (Ph.D) degree or its equivalent who are recruited, developed, and retained. One of the key factors in motivating and retaining academic staff is that of having in place a comprehensive and competitive incentive system for existing academic staff, for new ones, as well as for aspiring ones.

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