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Evaluating the utilisation of resources in higher education institutions: The case of teaching space at a Ugandan university

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Abstract
All over the world, there is pressure on higher education institutions (HEIs) to admit increasing numbers of students. In most parts of Sub-Saharan Africa, however, the increasing demand for student places at HEIs is in the context of enormous reductions in the availability of institutional resources. Efforts at the expansion of enrolments have focused on expanding the availability of resources; however, utilisation of these resources is not evaluated for optimal usage. Taking the case of teaching space at Makerere University, this article argues that this could affect educational quality, access to higher education or both. Grounded on Juran’s generalization of Pareto’s Optimality Theory, the article proposes systematic, and multidimensional, evaluation of the utilisation of resources. It concludes that this might expose unexploited capacity to expand enrolments while adhering to relevant standards of quality assurance and ensure that resources are expanded in line with real need.

Keywords
access, Pareto theory, quality assurance

Introduction
All over the world, there is overwhelming pressure on higher education institutions to admit increasing numbers of students (Altbach, 2006; Musaazi, 2006; Muzaki and Mugisa, 2006; Nkata, 2004; Wabudeya, 2004). In most parts of Sub-Saharan Africa, however, the increasing demand for access to these institutions is in the context of enormous reductions in their funding (Kwesiga and Ahikire, 2006; Mamdani, 2007; Musaazi, 2006; Muzaki and Mugisa, 2006; [Uganda] National Council for Higher Education [NCHE], 2004a; Oyebade, 2007; Zarummai et al., 2004). Consequently, enrolment expansions that are not matched by proportionate expansions in the
availability of the resources that the institutions need to assure quality are one of the major con-
strains threatening the quality of education that the institutions offer (Adedeji et al., 2008; 
Babalola and Jaiyeoba, 2008; Kasozi, 2003; NCHE, 2004a; Zarummai et al., 2004).

In most instances, the institutions have sacrificed quality – through increasing enrollees without 
expanding resources; or students’ access to higher education – by rejecting qualified applicants. 
Mindful of resource limitations, many higher education managers and policy makers have accepted 
these anomalies as expedient (see e.g. Mamdani, 2007; Oyebade, 2007). Accordingly, efforts to 
expand enrolments and enhance quality at the institutions have prioritized attracting resources to 
the institutions – from governments, donors and fees (see e.g. Kasozi, 2007; Kassam, 1999; 
Ssempebwa, 2007).

Ironically, utilisation of the resources that the institutions have is not evaluated – apparently 
because it is assumed that, once available, resources are put to optimum use. Taking the case of 
teaching space at Makerere University, however, this article argues that this assumption is probably 
wrong and that it could affect quality assurance (at) and access to the institutions. Based on Juran’s 
generalization of Pareto’s Optimality Theory, therefore, the article advocates a multidimensional 
evaluation of the institutions’ utilisation of resources, arguing that this might expose unexploited 
capacity to expand the institutions’ enrolments while also improving their adherence to relevant 
standards of quality assurance in a cost-effective way.

Makerere University

Makerere University, Uganda’s flagship higher education institution (Lejeune, 1999), was estab-
lished in 1922 as a technical college, by the British colonial administration in East Africa. The 
main aims of establishing the institution were to: 1) provide completers of secondary education 
with higher education, so that they would not seek it outside Africa (where they might become 
political activists pressing for independence); and 2) produce manpower for positions in the colo-
nial administration (Ssekamwa, 1997; Tiberondwa, 1998). It developed into an institution of nota-
ble repute in the Sub-Saharan region (Altbach, 2005a; Eisemon and Salmi, 1993; Nakanyike and 
Nansozi, 2003; Sicherman, 2005), and therefore, tended to be elitist. All of its students were spon-
sored by the government (of Uganda) and courses of study were offered in a few areas, primarily 
targeted at meeting human resource needs in the government’s service.

During the 1970s and 1980s, however, the University was grossly underfunded, by the govern-
ment – due to the country’s economic downturn and subsequent adoption (in the mid-1980s) of IMF/ 
World Bank recommended structural adjustment programmes that discouraged government spending on higher education (Mamdani, 2007). According to Mayanja (1996), this affected the University’s potential for quality assurance. Physical resources deteriorated; salaries were outstripped by inflation, 
thereby leading to moonlighting and staff attrition; and curricula were not reviewed, reducing the 
relevance of the University’s study programmes to the country’s human resource-related needs. At 
the same time, pressure mounted on the University to expand its student intake, since barely 22 per-
cent of applicants eligible for admission were being accepted even though this was the only univer-
sity in the country (Makerere University Planning and Development Department [PDD], 2000).

Shortage of teaching space at Makerere University

Hitherto the reserve of a select few (state-sponsored students), in the early 1990s, Makerere started 
enrolling fee-paying students (Mayanja, 1996). This was well-received by many education policy 
makers (see e.g. Court, 1999; Kassam, 1999; Mayanja, 1996), mainly because it expanded access
to the University and improved its funding situation while reducing its dependence on government, whose allocation to higher education was increasingly inadequate (see e.g. Makubuya, 2000; Muvawala, 2003; Wanambi, 2004). Indeed, between 1991 and 2003, the University’s enrolment expanded by 451 percent (PDD, 2004), albeit without proportionate expansion in the availability of teaching resources. Over the last 10 years, therefore, expansion of the University’s enrolment has been the subject of much criticism (see e.g. Altbach, 2005b; Mamdani, 2007; Rwabukwari, 2002; Ssekamwa, 2000; Tumusiime, 2007).

The transition from elitist to mass higher education resulted, in part, from:

- the democratization, liberalization and commercialization of higher education (Byaruhanga, 2002; Mamdani, 2007);
- implementation of mass pre-higher education programmes like Universal Primary and Secondary education; and
- the government’s prioritization of pre-higher, in lieu of higher, education (Kajubi, 2001).

In the face of this transition, however, it was not possible, in the short run, for the availability of teaching resources to be expanded to match the increasing number of students. This is especially true of teaching space (rooms, theatres, laboratories, workshops and studios that are used in the teaching and learning process), since, unlike the procurement of human resources and teaching aids, the erection of appropriate teaching space requires heavy capital expenditure and is constrained by the fixed supply of land at the University. The University’s strategic plan (PDD, 2008) acknowledges that the University is constrained by lack of sufficient teaching space.

To surmount this constraint, Rwabukwari (2002) suggested centralization of the timetabling of the utilization of teaching space, through: 1) using dining halls at the University as teaching areas and pitching tarpaulin tents for use as teaching areas, in the short run; and 2) construction of very large lecture halls, in the long run. The (Republic of Uganda) Parliamentary Committee on Social Services, the statutory body charged with meeting the University’s resources needs, recommended the conversion of halls of residence at the University into teaching areas (Republic of Uganda [RoU], 1999).

However, these recommendations did not help the shortage of teaching space because: 1) centralization of the timetabling of the utilisation of teaching areas did not expand the teaching space available; 2) dining halls and tarpaulin tents proved not to be appropriate for use as teaching/learning areas; and 3) conversion of halls of residence at the university into teaching areas is very expensive and is itself constrained by many factors.

Accordingly, enormous efforts have been made to construct new buildings – often with the support of donor organizations (see PDD, 2000, 2004). Between 1994 and 2007, for instance, classroom space at the University expanded by 96 percent (Table 1).

Table 1. Expansion of academic space at Makerere University, 1994–2007 (m²)

<table>
<thead>
<tr>
<th></th>
<th>Classrooms</th>
<th>Laboratories</th>
<th>Workrooms</th>
<th>Communal</th>
<th>Circulation</th>
<th>Gross Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994/5</td>
<td>9832</td>
<td>22467</td>
<td>12933</td>
<td>7815</td>
<td>13834</td>
<td>66881</td>
</tr>
<tr>
<td>2006/2007</td>
<td>19262</td>
<td>26719</td>
<td>16999</td>
<td>14175</td>
<td>22000</td>
<td>99146</td>
</tr>
<tr>
<td>Difference</td>
<td>9430</td>
<td>4252</td>
<td>4066</td>
<td>6360</td>
<td>8166</td>
<td>32265</td>
</tr>
<tr>
<td>% Expansion</td>
<td>96</td>
<td>19</td>
<td>31</td>
<td>82</td>
<td>59</td>
<td>48</td>
</tr>
</tbody>
</table>

Source: Makerere University Fact Book (2010)
Notwithstanding, efforts to construct new buildings are constrained by limitations in the availability of money (Kasozi, 2007; Mande, 2006; Mayanja, 2007; Ssempebwa, 2007). They are also constrained by the limited availability of land, as the University’s campus is increasingly built-up. Besides, the opportunity cost of constructing lecture halls – in lieu of funding pedagogy and research – is noteworthy.

In addition to efforts to construct new buildings, therefore, the University decided to reduce its intake, to match the number of students enrolled and teaching space available (Ahimbisibwe, 2005, 2007a, 2007b). This was despite the fact that many applicants eligible for admission were already being denied admission (Figure 1).

The decision to reduce the number of students admitted was welcomed by many stakeholders. However, the optimism that admission of fewer students per se would enhance quality assurance at the University was undermined by factors that supported the admission of as many fee-payers as possible, namely the democratization of higher education (Byaruhanga, 2007) and the need to fund the University through ‘economies of scale’ in the levy of student fees (PDD, 2000). Just a year after down-sizing entrants by 2160 in 2007, The New Vision (2008) reported that the University decided to increase the number of fee-paying students admitted for the 2008–9 academic year by 4000, even though the University denied any intentions to increase its intake (see Ahimbisibwe, 2008; Kadhilo, 2008).

NCHE (2004b) projected that, by 2010, 120,000 students would seek admission to higher education and Makerere University, whose student population is barely 40,000, is expected to absorb a significant number of these applicants, being the country’s flagship higher education institution (Lejeune, 1999). Even though hope is (tacitly) being put in emerging, and transnational, higher education institutions to accommodate higher education aspirants for whom places cannot be found at the University, this is not likely to happen especially in the short and medium terms.

Curtailing the number of students admitted to the University is unviable because of Uganda’s vision that higher education should be accessible to all qualifying candidates (NCHE, 2004b; RoU, 1992). The priority, therefore, is the enrolment of the highest possible number of students using available teaching space, rather than curtailing the number of students admitted and construction of new teaching areas.
Hence the importance of evaluating the use of the space, to scrutinize whether it is being put to optimum use and to ensure that qualified applicants are refused admission only when there are no places. Without such an evaluation, inadequacies in the utilisation of the space may not be discerned, to the detriment of access and quality. Otherwise colossal sums of money could be expended on constructing new teaching areas unnecessarily.

Theoretical underpinning and evaluation of the use of teaching space

The case for evaluating the rate of use of teaching space hinges on Juran’s generalization of Vilfredo Pareto’s Theory, cited by Reh (2005) and Lipsey and Chrystal (1999). According to the theory, optimality in the utilisation of resources is attained when it is impossible to reallocate consumption activities to make one person better off without making anyone worse off (Lipsey and Chrystal, 1999). Yet the 80-20 principle of the theory contends that, nevertheless, organizations derive 80 percent of their value from just 20 percent of their resources (Evans and Wolf, 2005), the inference being that they do not put their resources to optimum use. Arguing for departure from this underutilisation of resources, therefore, Juran opines that optimality in the utilisation of resources necessitates movement from the 80-20 level to a 1-1 level, at which each unit of resource input produces a proportionate level of output (cf. Evans and Wolf, 2005; Reh, 2005).

These arguments are relevant to the case for evaluating the utilisation of teaching space in two main ways. First, the proposition that optimality in the utilisation of resources is attained when it is impossible to reallocate consumption activities to make one person better off without making anyone worse off suggests that, Pareto optimality corresponds to a situation in which it is impossible to admit a student into a teaching area without removing another or affecting the quality of teaching and learning. Thus, Bray (2008) observes that although intensive utilisation of teaching resources primarily aims to expand access and minimize costs, some education systems achieve these aims at the expense of quality. It also agrees with Owolabi (1995b: 7), who notes that:

there is [a] difference between maximising and optimising the use of space. To fit a class of 30 into a workshop with 15 workbenches would be increasing the use of space but the teaching/learning situation may be undesirable. Maximisation of space utilisation does not take into account conveniences in the technology of knowledge acquisition. The utilisation that provides the highest economic efficiency is the maximum while the utilisation that provides ideal teaching/learning conditions, and is the most economically efficient under that ideal condition, is the optimum.

Second, the 80-20 principle suggests that the University does not put its teaching space to optimum use, a hypothesis whose credence the evaluation of the utilisation of teaching space should consider.

From this theoretical viewpoint, it is clear that, to facilitate enrolment of the highest possible number of students with adherence to relevant standards of suitability of class size, evaluation of the utilisation of teaching space will involve investigation of both under- and over-utilisation of the space – to verify the hypothesis that the institution does not put its teaching space to optimum use.

Owolabi (1995a) enumerates three dimensions to the evaluation of the utilisation of teaching space: 1) occupancy factor or space utilisation rate (SUR); 2) frequency of use factor or time utilisation rate (TUR); and 3) global utilisation rate (GUR). SUR establishes the ratio of the number of students occupying a teaching area to the area’s occupancy capacity – as stipulated for different types of teaching areas by relevant quality regulatory bodies (see e.g. NCHE, 2004a; Space...
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Management Group [SMG], 2006) or/and institutional policies (see e.g. Victoria University, 2006). TUR establishes the ratio of the number of time periods for which a teaching area is in use to the number of periods for which the area is available for use in a teaching session (usually a day) – also stipulated by relevant regulatory bodies. SUR and TUR do not link the use of space with the use of time. Hence, the proposition of the GUR dimension (DES, 1992), which is a product of SUR*TUR (Owolabi, 1995a). However, GUR returns a theoretical ratio, indicating the overall utilisation of teaching space, but which may not satisfactorily guide appraisal of the utilisation of teaching space. For example, a GUR of 20 percent returned by the product of TUR = 40% * SUR = 50% indicates that, overall, 20 percent of the capacity of a teaching area is utilised, albeit without succinctly pinpointing the source(s) of the underutilisation so as to guide improvement. Besides, through linking TUR and SUR, GUR could disguise suboptimal utilisation in any, or both, of TUR and SUR, as long as such suboptimal utilisation is offset by under- or over-utilisation in the other dimension or at another time. This is despite the fact that Pareto optimality necessitates distinguishing all inadequacies that may exist in the utilisation of space. Conversely, SUR and TUR clearly disaggregate the extent to which the occupancy capacity of teaching areas and the time periods for which the areas are available are utilised respectively.

Accordingly, the efficacy of the three dimensions (i.e. TUR, SUR and GUR) is limited – especially in practice-leaning evaluations of the utilisation of teaching space that have for their objective, the enhancement of optimality. None of them integrates the use of teaching space and time with students’ need for these resources, so they do not allow computation of the intake capacity of teaching space in terms of student places – to enable comparison of the number of students admitted to the optimum. This points to the need for a synthetic, and straightforward, approach to evaluation that does not only link the utilisation of teaching space and time but also integrates students’ needs for the same, to expose the student intake capacity of teaching space with precision.

Owolabi (1995c) suggests one such approach. According to the approach, Intake Capacity of Institution = \( \sum_{k=1}^{n} \left( \frac{H_d D_w S_a}{C H_w} \right) \) where k = a teaching area; n = the number of teaching areas in the institution; \( H_d \) = the number of hours a teaching area is available for use in a day; \( D_w \) = the number of days in the teaching week; \( S_a \) = the number of student-places, or workstations, in a teaching area; and \( C H_w \) = the average number of contact hours for which a student in the institution registers. Notwithstanding the realism this approach brings to the computation of intake capacity, critical consideration of its methodology, and output, indicates that, unlike TUR, SUR and GUR, it is without satisfactory diagnostic value. Specifically, where it indicates that intake capacity is not optimally utilised, it neither highlights the source of the problem nor indicates the adjustments required to reach Pareto optimality.

Though each of the four dimensions of the evaluation of the utilisation of teaching space brings some perspective of precision to the evaluation, therefore, they are each associated with some limitations. This means that decisions to construct new teaching areas or curtail the number of students admitted should be informed by multidimensional evaluation of the rate of use of space.

Knowledge gap and case for evaluating the utilisation of resources

At Makerere University, utilisation of teaching space has not been subjected to multidimensional evaluation. Rather, Luboobi (2007) and PDD (2000, 2004, 2008) affirm that efforts to assure quality amidst the rising number of eligible applicants have concentrated attention on reducing the proportion of these applicants admitted and constructing new teaching areas.
An apparent reason for this is that, during the 1990s, the proponents of enrolment expansion at the University focused on maximizing the occupancy of teaching space (i.e. economic efficiency). This led to congestion of students in teaching areas (Mamdani, 2007; Ssekamwa, 2000) and, consequently, deterioration in the quality of the teaching and learning environment (cf. Adeyemi, 2007; Blatchford et al., 2002; Opolot-Okurut, 2008), thereby reinforcing the presumption that the capacity of teaching areas to accommodate students has been exceeded.

Nonetheless, indepth analysis (Apori, 1997; Mensah, 2000; Owolabi, 1993, 1995b) demonstrated that inadequate teaching space at the University of Cape Coast, Mfantsipim S.S.S. and University College of Winneba and University of Ghana respectively, had (underutilised) capacity to accommodate students while improving quality, meaning that inadequacies of teaching space that are deduced from congestion of students in teaching areas might be more apparent than real.

Thus, a key argument advanced here is that both the proponents and critics of the construction of new teaching areas and/or curtailing of the number of students admitted to Makerere University are probably misleading – because their contention is neither concerned for optimality in the utilisation of teaching space nor based on multidimensional evaluation of the utilisation of the space. The emphasis on occupancy of teaching areas (i.e. economic efficiency) lead to a situation in which students were congested in the teaching areas during some study sessions. Similarly, because they place attention only on the occupancy of the teaching areas, the critics of this congestion do not appreciate the possibility of underutilisation during time periods for which these teaching areas are available. Streamlining the utilisation of space, rather than enrolment reduction or construction of new teaching areas, may be the solution to the problem of congestion.

In addition to establishing the rate of use of teaching space, however, an evaluation needs to address the factors influencing the established rate of utilisation. This is because several authors (e.g. Batra, 1998; Bray, 2008; Chaube and Chaube, 1996; Ezewu, 1998; International Association of Universities [IAU], 2008; Odaet, 2000; Owolabi, 2006; Weaver-Hightower, 2008) suggest that the utilisation of educational resources should emerge out of, and respond to, pertinent regional, national and institutional peculiarities. Models of optimality in the utilisation of teaching space may not be replicable across settings.

I argue that in order to focus on optimality and multidimensionality, the evaluation should follow a multidisciplinary approach – addressing the architectural, ergonomic, policy, curricula, geographical, philosophical and societal factors that are pertinent to the rate of use of teaching space in higher education. In the UK, for example, the Higher Education Funding Council for England, Scottish Funding Council, Higher Education Funding Council for Wales and the Department for Employment and Learning (in Northern Ireland) commissioned the UK Higher Education Space Management Group (SMG) not only to evaluate effectiveness in the utilisation of teaching space in higher education institutions but also to examine diverse and interconnected variables and experiences that are relevant to this effectiveness (Figure 2).

As a result the group not only identified correlates of teaching space performance, benchmark best practices and the factors that promote/constrain implementation of these practices but also developed an interactive model that enables institutions to: 1) calculate the annualized cost of their estates; 2) model and benchmark the size of these estates; and 3) assess the impact of different estate cost assumptions and carry out scenario planning (SMG, 2006b).

Evaluation of the rate of use of teaching space also has to address the availability of the human and material resources that complement teaching space in the teaching and learning process. This (holistic) approach can disaggregate the contribution of teaching space to the limited availability of student places at the University from that of other factors. Here, a possible hypothesis is that, although limitations in the availability of teaching space have been primarily blamed for the
congestion of students in teaching areas and advanced to justify the curtailing of the number of enrollees and construction of new teaching areas, other factors are more important in reinforcing the congestion and, thus, limiting access to the University.

Why has evaluating the rate of use of teaching space hitherto not attracted attention, despite its potential for expanding access to higher education and enhancing quality assurance in a cost-effective way? An apparent reason for this is that, relative to the other interventions being implemented to improve access and quality assurance in African higher education (i.e. increasing the funding of higher education institutions; and promotion of e-learning, distance/‘off-campus’ learning and enrolment at new and multinational higher education institutions), optimality in the utilisation of educational resources has not attracted scholarly attention (Oyesola, 2000).

Even leading higher education websites that feature recent research and developments in African higher education like African Higher Education Research Online (AHERO) and International Network of Higher Education in Africa (INHEA) as well as major research databases like JSTOR, African Journals Online (AJOL), Education Research Information Centre (ERIC) and Database of African Theses and Dissertations (DATAD) do not feature recent developments on the utilisation of resources in general and teaching space in particular.

For a host of reasons, efforts at examining the utilisation of educational resources available primarily focus on pre-higher education (see e.g. Aaron and Limor, 2004; Abdulkareem et al., 2008; Adeboyeje, 1984; Adeyemi, 2007; Bray, 2008; Farombi, 1998; Linden, 2001; Nhundu, 2000; Oloyede, 2003; World Bank, 1998) or European and American higher education (see e.g. SMG, 2006a; 2006a). This limits their applicability for Sub-Saharan higher education planning. Other
efforts at the study of teaching space primarily focus on the (architectural) design and functionality of space (see e.g. Beth Schapiro and Associates [BSA], 2001; Joint Information Systems Committee [JISC], 2006; John, 2005; Jorstad, 2007; Oblinger, 2006), and do not elucidate the utilisation of the space let alone the implications of such utilisation.

This focus also ignores the inadequacies of alternative approaches to space utilisation. For example, limitations to the possibility of expanding higher education funding (Ssempebwa, 2007); e-learning may not provide a practicable alternative for the expansion of access to higher education (Altbach and Knight, 2006; Kistan, 2005); and distance/‘off-campus’ learning are constrained by requirements for large capital investment in the development of distance learning materials (Akintayo, 2003; Oketch, 2006), difficulties inherent to the dispersion of some learning facilities from main to satellite campuses and need to provide (on-campus) teaching/learning space for distance learners’ ‘face-to-face’ sessions.

Optimization of the use of teaching space could enhance the efficacy of each of e-learning and similar ‘alternatives’ by ensuring that any additional funds and electronic and distance/‘off-campus’ learning facilities benefit an optimum number of students. The optimization of the utilisation of resources is important as an alternative and as a complement to other strategies.

It is against this background that the proposed evaluation approach is suggested. Besides teaching space, similar concerns can be raised about the utilisation of other resources (such as lecturers’ teaching time, laboratory apparatus as well as library, accommodation and sports facilities) at the University, and in other Sub-Saharan African higher education institutions. Take, for example, the case of utilisation of teaching resources and academic performance in technical colleges in Oyo State, Nigeria and that of investment in Information Communication Technologies (ICTs) in three Rwandan Higher Education Institutions. Both Adedeji et al. (2008) and Ssempebwa et al. (2007) have concluded that focus on the acquisition of resources should be complemented by focus on optimality in the utilisation of these resources, the inference being that these institutions too should evaluate utilisation of their resources for optimality.

It would not be unreasonable for funding agencies asked by higher education institutions to fund expansion of resources to expect that these institutions demonstrate that their need for extra resources is based on holistic evaluation of the utilisation of the resources they already have. Indeed, these agencies could also facilitate such evaluations along the lines that UK Higher Education funding councils supported SMG to develop guidelines and tools to deliver effective space management through multidimensional evaluation of teaching space management norms and practices (SMG, 2006a).

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