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## Abstract

**The study investigated the influence of performance management on operational efficiency in universities in Kenya which are facing more stringent accountability requirements by internal and external stakeholders, increased competition, and sharp decreases in funding over the recent past. Stakeholders, on the other hand, have higher outcome expectations. This has led to having to do more with less. One of the ways in which universities have employed to be more operationally efficient is performance management. Institutional theory anchored the study. Performance management was operationalized using Kinicki et al. (2013) performance management behavior questionnaire. The study adopted the positivist philosophy with a cross-sectional descriptive census design. A census was done on the population of 72 universities. The unit of analysis was the university. Primary data was collected through a questionnaire. The respondents for the study were the registrar administration, academic or equivalent. Operational efficiency was derived using 2016/2017-2019/2020 secondary data to employ data envelopment analysis (DEA) input-oriented Charnes Cooper Rhodes (CCR) model. Simple linear regression tested the influence of performance management on operational efficiency, confirming a positive correlation of 0.571. Performance management measures that need more attention are performance monitoring and linking rewards to performance. Goal setting, communication and performance expectations measures were well executed. DEA shows that technical efficiency declined over the 4-year period. The least technically efficient university was performing at a low of 38.87% which is quite low. The results show, in 2016/17, 41 universities were too large, 11 were too small and 20 were of optimal size. By contrast, in 2019/2020, there was a drop in those that were too large to 30 while those that were too small were 20. The study recommends greater attention to operational efficiency for relevance and survival of the universities. The county of location influences operational efficiency while the size of the university appears to have no effect.**

**Key Words**: Data envelopment analysis, Decision making unit, Operational efficiency, Performance management, Performance management behavior questionnaire, Universities

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## Introduction

Performance management takes different forms in organizations over time (Brown et al. 2014). The university environment, locally and globally, demands the development and retention of cutting edge technologies and staff (Crawshaw et al. 2012). This is done through establishing, monitoring and building staff and team performance and synchronizing this performance with the overall goals (Aguinis, 2019). Performance management is aimed at improving the efficiency of organizations (Nielsen, 2014). It leads to the achievement of a shared understanding of the target objective, why it is critical, and how it will be attained. It takes cognizance of the employee's abilities through planning, implementation, feedback, evaluation, and rewards. It is helpful for capacity building, regeneration and sustainability (Cascio, 2014) and improves organizational effectiveness, efficiency and performance. In the past, focus was more on defining and measuring individual and group performance. Babagana (2014) holds that it has now evolved to an aligned, integrated process that sets expectations, measures, reviews results, and rewards for organizational success.

The study's' context was universities which are critical to the future of Kenya as a significant provider of employment, skilled human resource, research and a consumer of public resources. Kenyan universities must urgently address operational efficiency to remain relevant and competitive (Mbirithi, 2013). Institutional theory underpinned performance management and operational efficiency by examining how entrenchment of characteristics of a university occurs (Meyer & Rowan 2012). An institution receives and gives information and stimuli from and to numerous sources both internal and external. Over time, this new information gives rise to shifts in how things are done altering behavior and patterns of thinking. These changes are then institutionalized giving rise to construction and convergent change processes. While construction is one of the outcomes of instituonalization, deconstruction is another where systems and institutions become irrelevant through weakening, collapse and replacement.

Operational efficiency in universities has significant implications for all stakeholders (Thornhill, 2016). Operational efficiency allows an organization to improve input output ratio by downscaling defects or producing better products in a shorter cycle (Leleu et al. 2014). It is shown as the ratio between output and input that is used to run a business operation. It is the production of better quality output as effectively as possible. Operational efficiency maximizes resource capabilities and minimizes wastage with the objective being to satisfy the client with better products and services. It entails mapping inefficient processes and procedures that impact on the organization negatively. New processes are then designed to overcome the mapped inefficient process (Halkos et al. 2016).

Data Envelopment Analysis (DEA) is an econometric alternative method to Stochastic frontier analysis based on regression analysis for measuring efficiency and modelling cost structures. It enables identification of organizations operating economies of scale as well as the most productive scale size (Leitner et al. 2007). In this study, the input orientation was employed. This assumes that the inputs

are exogenously fixed and estimates the minimum cost at which a decision-making unit would have produced the output. Data envelopment analysis is useful where there are multiple inputs and outputs and an absence of input and output prices. It also makes no assumptions regarding the functional form of the production function nor assigns weights apriori (Jonnes, 2006). It measures the efficiency of each unit as a ratio of the chosen inputs and outputs producing a production possibility frontier.

The Commission for University Education Report on Status of University Education in Kenya (2016) recommends that Kenyan universities must urgently address operational efficiency. The report cites performance management as one of the strategies that have led to operational efficiency in universities and notes that despite costly performance management strategies, universities are facing monumental challenges with operational efficiency especially in the light of dwindling funding from public coffers in this sector. Mbiriti (2013) held that there is no study that has measured relative operational efficiency in universities in Kenya. Thanassoulis et al. (2011) employed data envelopment analysis (DEA) in modelling efficiency of higher education institutions in England and established substantial gains in operational efficiency. To increase technical efficiency by between 20 to 27%, these institutions needed to increase student numbers. Nazarko and Šaparauskas (2014) applied DEA in evaluation of 19 polish Universities of Technology and recommended it is important for management in universities to be conscious that after a certain point, it makes no difference to operational efficiency index if there is additional inputs. Leitner et al. (2007) Austria, Taylor and Harris (2004) South Africa, McMillan and Datta (1998); Bradley et al. (2006) applied Data envelopment analysis in universities.

The respondent universities were assessed for technical efficiency over the four financial years from 2016/17 to 2019/20 as they are all operating the same technology within the same environment (Bradley et al. 2006). The analysis assumes that the technology within the decision-making units has not changed over the four-year period and the same assumption held for this study (Datta, 1998). A university's core business is teaching and research. The study focused on teaching and research efficiency by utilizing published audited accounts for the respective years. The data was confirmed with other sources namely University Funding Board, Ministry of Education and State Corporation Advisory Committee filled returns and graduation booklets. The study adapted Flegg et al. (2004) input and outputs. Inputs were number of academic and academic equivalent staff, number of full time and full-time equivalent students and aggregate expenditure excluding staff costs. Outputs were number and quality of undergraduate graduands, post graduate degrees awarded, capitation, research grants received and consultancy fee generated**.**

Research and consultancy as an output indirectly affects the quality of teaching output by attracting a certain calibre of staff. Since universities consult for government and industry, the income received can be used to estimate the value of the output produced. Flegg et al. (2004) argued that the use of research income as an output measure is challenging as it may also be an input. Significant deviations in research costs across academic disciplines

also cause distortions. Research income however reflects the perceived quality, as well as quantity, of research output and it should provide a more accurate output than publications or citations, which have a considerable time lag. Moreover, the necessary information is readily available. Research ratings might be a better measure than research income though such ratings appear too infrequently in most cases to be of good use. Consultancy income also has variations across disciplines. The primary aim of this study was to establish the influence of performance management on operational efficiency in universities in Kenya. Data envelopment analysis was used to measure relative efficiency in universities in Kenya.

**Literature Review**

The introduction of performance management has led many authors to empirically examine performance management and performance relationship (Ahn, 2001; Kaplan & Norton, 2001; Ittner et al. 2003). Performance management has been shown to direct and measure strategic effort Langfield and Smith (2003) thus reducing inefficiency. Marr and Schiuma (2003) directly addressed performance and operational efficiency. They concluded that attribution remains a big challenge for performance as well operational efficiency. Jeong and Phillips (2001) in operational efficiency and effectiveness measurement established the link between performance management initiatives as regards accurate estimation of equipment utilization. Performance management may lead to reduced cycle time, costs as well as better quality goods (Rummler & Branche, 2012). Comparative efficiency in libraries in universities in the United States was tested applying the data envelopment analysis approach. The study established that proper performance measurement and management was an important contributor to operational efficiency (Lee et al. 2013).

Davis and Albright (2004) showed a negative correlation between performance management and operational efficiency. Pursglove and Simpson (2007) benchmarked the performance of English universities, examining the effectiveness of teaching. They concluded that academic staff tended to view performance management as beyond their purview. Efficiency and effectiveness therefore arose from other variables such as quality of faculty or relaxation of examination standards rather than performance management. Adams (2013) held that performance management led to managed performance not necessarily operational efficiency. Mwangeti (2012) examined operational efficiencies of insurance industries in Kenya and established that operational inefficiencies in majority of the firms could be mitigated by employment of performance management techniques among other initiatives. Wall et Al. (2004) empirically investigated performance management effect on organizations with a finding being that management of performance had a positive correlation on customer care, process quality and operational efficiency. Guest (2001) illustrates that there still exists many other areas of exploration so as to better understand performance management and operational efficiency, theoretically, methodically and empirically. This study will therefore seek to confirm the direction and strength of the relationship.

Institutional theory examines the deeper and more resilient aspects of the institution. It is the main theory anchoring

performance management and operational efficiency in this study. Varying elements of institutional theory expound on how structures and strategies including performance management are generated, propagated, embraced and modified within the organization and how they degenerate translating to varying levels of operational efficiency **(**Meyer & Rowan, 2012). Innovations that are perceived to be successful become industrial norms and practices. Their legitimization eventually leads to a point where non adoption is viewed as remiss. Often times, such innovations become law. Firms will thereafter adopt the structural form or innovations whether or not it impacts efficiency (Scott, 2008). Institutional theory assumes that the structural components of an organization or a system are integrated and thus change in one necessitates change in another and that existing structures work within a balance (Greenwood et al. 2014).

## Research Methodology

Kinicki et al. (2013) developed and validated the Performance Management Behavior Questionnaire that has five performance dimensions that determine performance management which influence operational efficiency applied in the study to develop composite index for performance management. These dimensions are goal setting, communication, performance expectations, monitoring and providing consequences. This study adopted cross-sectional descriptive survey research design. Data envelopment analysis was employed using longitudinal data for the years 2016/2017 to 2019/2020. 72 Universities constituted the population of the study. A census was done for this study as opposed to sampling. The primary data instrument was administered using a semi-structured questionnaire on performance management applying the performance management behavior questionnaire. The five point likert scale was used. The respondents of the study were the registrar, administration, or equivalent applying the key respondent methodology. The data collection instruments were administered through emailing and drop-and-pick later methods. Out of the census population of 72 universities, a response rate of 58 was achieved. This was an 80% response rate. Kaagari (2011) achieved a 53% response rate in performance management practices and managed performance in public universities in Uganda. Gudo et al. (2011) looked at university expansion in Kenya from a quality perspective and achieved a response of 47%. The 80% response rate was thus considered adequate, as a response rate of between 30% and 50% is acceptable, especially where a study's key respondents' group is senior management (Saunders, 2009).

The Cronbach's (alpha) coefficient was employed to establish the internal consistency of the items under examination (Golafshani, 2003). The Cronbach alpha was 0.786. Face validity was boosted through developing and improving the research instrument using expert opinion obtained during various thesis examination stages (Bashir et al. 2008). A preliminary probe was administered by exposing the tool to a minor random sample of ten respondents to build content validity (Cooper & Schindler, 2011). The instrument utilized previous research questions for criterion and construct validity, namely the performance management behavior questionnaire.

Linearity, normality, multicollinearity, and homogeneity tests were carried out. The threshold level for the different statistics is listed below for each assumption. For multicollinearity, the variance inflation factor (VIF) is indicated. Table 1 shows the diagnostic results for the data.

**Table 1: Diagnostic Test Results**

| | **Normality** ***(Shapiro Wilks Test)*** | **Linearity** ***(ANOVA)*** | **Homogeneity** ***(Leven Test)*** | **Multicollinearity** ***(VIF Test)*** |
|---|---|---|---|---|
| The threshold assumption is met if | p > 0.05 | p > 0.05 | p > 0.05 | VIF 10 max |
| Performance Management | .756 | .065 | .059 | 1.882 |
| Operational Efficiency | .598 | .089 | .159 | 1.767 |

Normality was verified using the Shapiro Wilks test, which helps spot deviations from normality due to skewness, kurtosis, or both. All the variables, Performance management and operational efficiency had a P-value above 0.05, confirming normality. In addition, ANOVA tested linearity, which computes both the linear and nonlinear components of a pair of values. Linearity is confirmed if the P value is above 0.05. All the computed tests for linearity were above the P value of 0.05, confirming linear relationships between each predictor variable and the response variable. The Variance Inflation Factor (VIF) tested for multicollinearity. The multicollinearity assumption has a threshold of the VIF value of 10 maximum. In this study, VIF ranged between 1.787 and 1.882 for all tests, and therefore, VIF was below the threshold.

The respondents in the study were widely exposed to the variables under investigation, having worked many years in universities. This is more so because the respondents were in senior management, therefore highly involved, and were thus considerably knowledgeable in the areas under investigation. The Kenyan Constitution 2010 created a dispensation of 47 counties in Kenya with universities located in various counties. The university's county of location may affect the interaction of the variables under study. The Commission for Revenue Allocation developed a County Development Index along poverty, infrastructure, health, and education indices. The three bands of county classification were the most marginalized having an index of 0.27 to 0.518, moderately marginalized with 0.519 to 0.584, and well-off counties having an index of above 0.6. Six respondent

universities are located in the most marginalized counties, 32 in moderate counties, and 20 in well-off counties.

## Analysis, Research Findings And Discussion

Descriptive statistics show that performance goals are linked to the strategic and operational goals of the university. Outcomes are set in a participative manner and challenging yet attainable goals were set. This is encouraging and is in line with literature review for successful performance management. Two measures however are of concern as per the findings. The questionnaire sought to rate whether outcomes were set in a participative manner and whether expected performance was specific and measurable. The rating on the two measures was quite low and therefore more management attention needs to be paid to these two measures. The feedback in the respondent universities was usually given once a year at performance appraisal meetings between the supervisors and supervisees. Peer review that is part of the performance appraisal process is also affected negatively by comradeship and median review. This is turn affects corrective action. Effective corrective action is only possible if regular formal and informal feedback is available and communicated throughout the year in a timely manner (Kinicki et al. 2013). This feedback then loops back into planning, implementation and monitoring.

The study used secondary data to calculate operational efficiency for the 2016/2017 to 2019/2020 financial years. The inputs for the study adopted from Flegg et al. (2004) were the number of academic and academic equivalent staff, undergraduate students, postgraduate students and aggregate expenditure minus staff costs. The outputs were research, consultancy and other incomes, undergraduate degrees awarded adjusted for quality and postgraduate degrees. The published annual reports, graduation booklets and the University Funding Board proved instructive in getting the data for DEA analysis. The data was validated with data from the Ministry of Education and State Corporation Advisory Committee. Data envelopment analysis allows for the determination of the technical efficiency of each university for each financial year. Technical efficiency as shown in table is defined as the ratio of the weighted sum of outputs to the weighted sum of the inputs.

**Table 2: Technical efficiency**

| Financial year | Unweighted arithmetic mean | Weighted arithmetic mean | Standard Deviation | Minimum | crs | drs | Irs |
|---|---|---|---|---|---|---|---|
| 2016/2017 | 0.700 | 0.766 | 0.144 | 0.3887 | 41 | 11 | 20 |
| 2017/2018 | 0.661 | 0.684 | 0.132 | 0.4119 | 30 | 18 | 24 |
| 2018/2019 | 0.675 | 0.694 | 0.123 | 0.4002 | 36 | 14 | 22 |
| 2019/2020 | 0.730 | 0.786 | 0.131 | 0.4006 | 33 | 20 | 19 |

*****crs Constant returns to scale *****drs Decreasing returns to scale *****Irs Increasing returns to scale

Table 2 shows relative technical efficiency of the 58 responding universities. The unweighted arithmetic mean TE scores are characterized by a slight upward trend. The least performing university had 38.87% technical efficiency score compared to the best operationally efficient university in 2016/2017. This minimum score increased to 40.02% in 2018/2019. This conversion ratio of input to output is alarming as far as teaching, research and consultancy is concerned. There is urgent need to reevaluate approaches to improving this ratio considering the optimum mix of inputs for the low performing universities. The raw technical mean was thereafter weighted against the size of the university from the perspective of the number of students to derive the weighted arithmetic mean which was the composite index for operational efficiency. The weighting had negligible change after the weighting implying that the size of the university had no effect on technical efficiency. The results show that, in 2016/17, 41 universities were too large, 11 were too small and 20 were of optimal size. By contrast, in 2019/2020, there was a drop in those that were too large to 30 while those that were too small was 20 while those that were optimal remained more or less the same at 19.

### Comparative Technical Efficiency Across Frontier Universities

Table 3 shows the comparative technical efficiency among the best performing universities.

**Table 3: Comparative Technical Efficiency in Frontier Universities**

| Name | Technical Efficiency | | | |
|---|---|---|---|---|
| | **2016/2017** | **2017/2018** | **2018/2019** | **2019/2020** |
| University of Nairobi | 0.7436 | 0.7953 | 0.7002 | 0.7835 |
| Moi University | 0.5781 | 0.6141 | 0.6045 | 0.5976 |
| Kenyatta University | 0.8672 | 0.8574 | 0.8113 | 0.8456 |
| Egerton University | 0.7128 | 0.7005 | 0.7440 | 0.7166 |
| Maseno University | 0.5670 | 0.5690 | 0.5706 | 0.5994 |
| Jomo Kenyatta University of Agriculture and Technology | 0.6523 | 0.6758 | 0.6881 | 0.6890 |
| Technical University of Mombasa | 0.5307 | 0.5663 | 0.5200 | 0.5258 |
| Masinde Muliro University of Science and Technology | 0.5980 | 0.6008 | 0.6090 | 0.6000 |
| Dedan Kimathi University of Technology | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Chuka University | 0.8234 | 0.8578 | 0.8500 | 0.8465 |

| | | | | |
|---|---|---|---|---|
| Laikipia University | 0.7224 | 0.7008 | 0.7996 | 0.7467 |
| Kisii University | 0.9978 | 0.9992 | 0.9878 | 0.9734 |
| Multimedia University of Kenya | 0.8113 | 0.8004 | 0.7896 | 0.8102 |
| University of Kabianga | 0.6678 | 0.6690 | 0.7003 | 0.6795 |
| Karatina University | 0.8943 | 0.8966 | 0.8900 | 0.8915 |
| Meru University of Science and Technology | 0.7674 | 0.7856 | 0.7634 | 0.7610 |
| Kirinyaga University | 0.9620 | 1.0000 | 0.9409 | 0.9964 |
| Pwani University | 0.6781 | 0.6003 | 0.5904 | 0.5991 |
| Murang'a University of Technology | 0.9934 | 0.9998 | 1.0000 | 0.9976 |
| Machakos University | 0.7812 | 0.7801 | 0.7892 | 0.7007 |
| University of Eldoret | 0.7845 | 0.7904 | 0.8129 | 0.7903 |
| Kibabii University | 0.6321 | 0.6500 | 0.6457 | 0.6230 |
| Maasai Mara University | 0.5438 | 0.5436 | 0.5385 | 0.5004 |
| The Co-operative University of Kenya | 0.8919 | 0.8902 | 0.8951 | 0.8387 |
| Rongo University | 0.6556 | 0.6509 | 0.6848 | 0.6999 |
| Technical University of Kenya | 0.6853 | 0.6900 | 0.7329 | 0.7007 |
| Garissa University | 0.5902 | 0.5001 | 0.5993 | 0.5968 |
| Jaramogi Oginga Odinga University of Science and Technology | 0.6874 | 0.6997 | 0.7026 | 0.6900 |
| Taita Taveta University | 0.5767 | 0.5644 | 0.5132 | 0.5600 |
| University of Embu | 0.8450 | 0.8399 | 0.9012 | 0.9555 |
| Alupe university | 1.0000 | 1.0000 | 0.9906 | 1.0000 |
| Tom Mboya university | 0.8763 | 0.8869 | 0.8992 | 0.8994 |
| Tharaka university | 0.7998 | 0.8017 | 0.8390 | 0.8412 |
| Kaimosi Friends University | 0.8043 | 0.8005 | 0.8213 | 0.8690 |
| Mount Kenya University (MKU) | 0.7825 | 0.7998 | 0.8003 | 0.8112 |
| University of Eastern Africa, Baraton | 0.6758 | 0.6995 | 0.6900 | 0.7026 |
| Daystar University | 0.7128 | 0.7188 | 0.7491 | 0.8114 |

| | | | | |
|---|---|---|---|---|
| Africa Nazarene University | 0.7002 | 0.7401 | 0.7405 | 0.7501 |
| Scott Christian University | 0.4551 | 0.4792 | 0.4880 | 0.4640 |
| Kabarak University | 0.8881 | 0.8944 | 0.8467 | 0.8996 |
| Strathmore University | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Zetech University | 0.8123 | 0.8045 | 0.8690 | 0.8371 |
| Kiriri Women's University of Science and Technology | 0.4650 | 0.5902 | 0.4948 | 0.5000 |
| Catholic University of Eastern Africa (CUEA) | 0.9981 | 1.0000 | 0.9956 | 0.9593 |
| Kenya Methodist University | 0.3789 | 0.3940 | 0.4002 | 0.4006 |
| Adventist University of Africa | 0.5890 | 0.5614 | 0.5749 | 0.5488 |
| Great Lakes University of Kisumu | 0.3887 | 0.4455 | 0.4112 | 0.4078 |
| St. Paul's University | 0.6449 | 0.6481 | 0.6930 | 0.7044 |
| KCA University | 0.9712 | 1.0000 | 1.0000 | 0.9979 |
| Management University of Africa | 0.7068 | 0.7767 | 0.7002 | 0.7369 |
| Aga Khan University | 0.7679 | 0.8009 | 0.8377 | 0.8728 |
| Kenya Highlands University (KHU) | 0.7853 | 0.7549 | 0.8177 | 0.8039 |
| Tangaza university | 0.6545 | 0.6506 | 0.6498 | 0.6390 |
| Turkana university college | 0.6435 | 0.6221 | 0.6005 | 0.6694 |
| Bomet university college | 07834 | 0.7900 | 0.7894 | 0.8100 |
| Marist International University College | 0.6022 | 0.6015 | 0.5989 | 0.6057 |
| Hekima university college | 0.8674 | 0.8637 | 0.8009 | 0.8722 |
| Pioneer International University | 0.6894 | 0.7960 | 0.7995 | 0.7209 |
| Lukenya University | 0.4378 | 0.4467 | 0.4534 | 0.4119 |
| Gretsa University | 0.5114 | 0.5007 | 0.5001 | 0.5990 |
| Riara University | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Uzima university | 0.7827 | 0.7996 | 0.7993 | 0.8002 |

Table 3 above shows that on average public universities are more efficient as opposed to private universities as far as teaching and research. Dedan Kimathi University of Technology is the most operationally efficient public university and forms the

frontier for all the years. In 2017/2018 and 2018/2019, Kirinyaga and Muranga Universities also formed the frontier while Alupe, a relatively young university was also in the frontier for all years except 2018/2019. Similarly, Strathmore was the most operationally efficient private university across the four years. Catholic University of East Africa was optimally efficient in 2017/2018 while KCA university was in the frontier for 2 years in 2017/2018 and 2018/2019.Riara University was the most operationally efficient in all the years. The operational efficiency general trend in the four years is a slight increase or decrease across the four years. This is in spite of a significant increase in the level of inputs over the years**.** The study therefore establishes a disappropriate change in operational efficiency given the consistent increase in inputs. This needs careful monitoring to ensure that the conversion rate of inputs to outputs is optimum.

**Frontier Technical Efficiency in Universities**

The best performing universities were then formed into a peer group for comparative analysis to establish how they perform against each other as shown in table 4.

**Table 4: Frontier Comparative Technical Efficiency in Universities**

| Decision Making Unit(DMU) | University | County of Location | Technical Efficiency | | | |
|---|---|---|---|---|---|---|
| | | | 2016/2017 | 2017/2018 | 2018/2019 | 2019/2020 |
| DMU9 | Dedan Kimathi University of Technology | 3- Nyeri | 1.0000 | 1.0000 | 0.9988 | 1.0000 |
| DMU13 | Kisii University | 3-Kisii | 0.8554 | 0.9005 | 0.9914 | 0.9947 |
| DMU18 | Kirinyaga University | 3-Kirinyaga | 0.9320 | 0.9974 | 0.9832 | 0.9964 |
| DMU20 | Murang'a University of Technology | 2-Muranga | 0.9934 | 0.9998 | 1.0000 | 0.9971 |
| DMU31 | University of Embu | 2- Embu | 0.9201 | 0.9115 | 0.9187 | 0.9930 |
| DMU43 | Strathmore University | 3-Nairobi | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| DMU46 | Catholic University of Eastern Africa (CUEA) | 3-Nairobi | 0.9998 | 1.0000 | 0.9995 | 0.9930 |
| DMU54 | KCA University | 3-Nairobi | 0.9948 | 0.9860 | 0.9099 | 0.9993 |
| DMU56 | Riara University | 3-Nairobi | 0.9812 | 0.9945 | 0.9969 | 0.9991 |
| DMU62 | Alupe university | 1-Busia | 0.9721 | 0.9003 | 0.9306 | 1.0000 |

County of Location SPSS classification as per Commission for Revenue Allocation Development Index

*1- Most Marginalized County
*2- Moderately Marginalized County
*3- Well off county

The comparative frontier analysis in table 4 shows competitive operational efficiency regardless of whether the university is public, private or a public university college. The best or frontier remain fairly competitive with Dedan Kimathi and Strathmore leading the peer group. The results show that operational efficiency universities in Kenya is not a function of age or size or when the university was established or chartered though the best universities were relatively young in age as per table 4. The study adopted the County Revenue Allocation County Development Index Classification. The index creates 3 bands of development for the 47 counties. The bands are most marginalized with a development index of 0.27 to 0.518, moderately marginalized 0.519 to 0.584 and well-off counties that have a development index of 0.6 and above. For the purpose of SPSS classification for analysis, the coding was 1, 2 and 3 for most marginalized, moderately marginalized and well off counties respectively. Table 4 shows that only 1 university Alupe was located in a most marginalized county. Muranga University of Technology and University of Embu were located in moderately marginalized while the rest 7 were in well of counties. The most operationally efficient universities were thus concentrated in well off counties as per the CRA county classification index and therefore the county of location affects to an extent operational efficiency.

The influence of performance management and operational efficiency was tested with the following hypothesis;

**$H_1$: performance management influences operational efficiency**

An overall index for performance management variable by computing composite index for the five dimensions of the performance management behaviour questionnaire namely goal setting, communication, performance expectations, monitoring and providing consequences, which each had its own measures. Data envelopment analysis was used to compute the weighted arithmetic mean which is the composite index for operational efficiency. Simple linear regression was used to test the hypothesis. Table 5 shows the simple linear regression results.

**Table 5: Test Results for the Effect of performance management and operational efficiency**

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Change Statistics | | | |
| Model | *R* | *R Square* | *Adjusted R Square* | *Std. Error of the Estimate* | *R Square Change* | *F Change* | *df1* | *df2* | *Sig. F Change* |
| 1 | .571[a] | 0.326 | 0.324 | 0.94788 | 0.326 | 200.935 | 1 | 416 | 0.000 |

**ANOVA**

| Model | | Sum of Squares | def. | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 180.537 | 1 | 180.537 | 200.935 | .000[b] |
| | Residual | 373.769 | 416 | 0.898 | | |
| | Total | 554.306 | 417 | | | |

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 3.206 | 0.046 | | 69.146 | 0.000 |
| | PM | -1.126 | 0.079 | -0.571 | -14.175 | 0.000 |

a. Dependent Variable: Operational Efficiency

b. Predictors: (Constant), Performance Management

Table 5 shows that the correlation coefficient for the relationship between performance management and operational efficiency is R=.571 indicating a positive relationship between performance management and operational efficiency. The coefficient of determination ($R^2$) = 0.326 which indicates that 32.6% of the variation in operational efficiency is accounted for by changes in performance management. The remaining 67.4% is explained by other factors not in this study. Analysis of variance (F=200.935, P-value = .000<0.05) confirmed the overall significance of the regression model. Thus, the regression model was fit for prediction. The results further indicate that beta coefficient for performance management and operational efficiency was significant (β=-0.571, t = -14.175, P-value=0.000<0.05), suggesting that for every one unit increase in performance management, operational efficiency decreases by 0.571 units, holding other factors constant. The hypothesis that performance management has influence on operational efficiency was thus confirmed. The predictive model of performance management on operational efficiency was of the form;

***OE = 3.206 – 0.571PM***

Where OE stands for operational efficiency and PM stands for performance management.

## Conclusion

The study shows that goal setting, communication, performance expectations, monitoring and providing consequences are strong influencers of operational efficiency. This is consistent with the findings of Thorpe and Halloway (2008) who found that there are potential different combinations of the performance management dimensions from the performance management behavior instrument that are stronger influencers of performance management. Test of hypothesis on performance management and operational efficiency showed a positive relationship. The coefficient of determination showed that the influence of performance management on operational efficiency is moderate and significant. The results are consistent with the findings of Babagana (2014) that suggested that the relationship between performance management and operational efficiency may be influenced by incidental variables and attitudes (Heinrich, 2002). In addition, Buchner (2007) found a weak effect of performance management related variables on operational efficiency, but rather indirect effects of other variables, therefore suggesting that there is also an indirect relationship between performance management and operational efficiency.

## Recommendations

### *Recommendation for Practice*

Government support for universities through grants, capitation, research and consultancy has gone down significantly. Technological and pedagogical shifts, increased stakeholder expectations and changing curriculum needs have also increased the pressure facing the universities. There is a shift towards universities becoming more operationally efficient by developing income generating units and operating as profit making organizations for sustainability. The prevailing environment demands that inputs are converted at a better rate to higher outputs. The study shows that though this shift is desired, it is not yet a reality as shown in table 4. Only 10 out of the 58 universities were operationally efficient in the course of the four years. In the search for higher operational efficiency, there has been commercialization of the core business of the

university posing a danger that the focus on profit making may compromise quality of teaching and research. A university marketing, curriculum, faculty practices and all other activities towards support of teaching and research must be meet and exceed the quality assurance threshold for academic excellence. The study recommends that quality control processes are in place as universities push for operational efficiency and performance management.

The study shows through data envelopment analysis that the expansion of universities in counties in Kenya may not have achieved increasing returns to scale in the university sector for each of the four years as majority of the universities were operating at non optimal returns to scales. The universities have however spurred economic growth in the counties of location especially nearby areas. The situation is made worse by lack of specialization of the universities in particular subject areas. It is recommended that universities specialize in line with labour and emerging markets. The study further recommends careful study or benchmarking with the universities operating at the frontier. Only 11 out of 58 universities (19%) of the universities, university colleges and universities operating under interim authority were optimally operationally efficient as far as teaching and research from data envelopment analysis. Further analysis to understand the sources of inefficiency is recommended as these sources of inefficiency could be congestion or scale. A study of the dynamics around the conversion of inputs into outputs for the 11 universities is also recommended to determine and replicate these sources of efficiency.

The utility of expanding universities from 7 in the 1990s to 35 currently must be justified in commensurate returns in investment in these facilities. Currently, apart from adding value to local communities and prestige to the county, majority of the universities are operating at sub optimal technical efficiency. The study shows that operational efficiency might not be a function of the county of location of the university or university college. The study therefore recommends that each university/ university college invests more in improving technical efficiency using localized and customized solutions. DEA Analysis also showed that in most universities, especially the public ones, there was a disproportionate ratio of technical to support staff. The ratio of technical and administrative to support staff was irrationally high, especially in older public universities significantly impacting technical efficiency negatively. The study recommends that universities rationalize support staff costs for improved operational efficiency.

Due to the skewed support staff numbers especially in older universities, the model proposed by Flegg et al. (2004) was adopted as it only considered academic and academic related staff on the assumption that this cadre of staff had a direct influence on teaching and consultancy. This DEA model of inputs considers that support staff do not have a direct effect on teaching. DEA should be run again on the universities with support staff being included to better inform management and policy makers on the effect of this numbers of this cadre on technical efficiency. Based on the findings, there is a positive relationship between performance management and operational efficiency. This is in spite of vast resources that have been committed to performance

management by universities over the years. Performance management facets such as goal setting, communication, performance expectation, monitoring and providing consequences need to be continuously studied to ensure alignment between performance management initiatives and operational efficiency. Managers should, therefore, be deliberate and aware of the changing environment within and without the university, with an eye on doing more and better for less.

### *Recommendations for Theory*

The findings further support institutional theory in that organizations are seen as deeply embedded in social and political environments, and organizational practices and structures reflect the rules, beliefs and conventions established in the wider environment. It is a collection of rules and routines that make action and legitimacy possible. Without institutionalization, sustainability of performance management and organizational learning will not be sustainable. Solutions to mismatched outcomes were, in many cases, developed by management and administrators, either individually or in teams, as change agents. The university corporate as a whole thereafter owned these solutions. However, for most universities, the performance management solutions were imposed externally or proposed by top management, which impacted ownership. Once the learned behavior is institutionalized, there must be mechanisms in place for relearning to avoid complacency.

### *Recommendations for Policy*

Vision 2030 and the Big 4 Kenyan Education Policy documents have identified university's critical role in the development agenda of Kenya. The study finding that performance management influences operational efficiency impacts how policy makers make decisions. Universities need to examine policies on goal setting, communication, performance expectation and monitoring. Particular attention must be paid to providing consequences. These can be integrated into policy to keep the university relevant and flexible. The nature or type of the university, county, and size significantly affect the variables in this study. When implementing a performance management system or addressing operational efficiency, the university must consider formulating a policy that allows for greater success given the context. DEA's exploration of technical efficiency and returns to scale also leads to the conclusion that policy needs to address how to make universities a better fit for initiatives aimed at boosting operational efficiency.

### *Limitations of the Study Research*

Over time, universities in Kenya have invested in several performance management initiatives, including performance contracting, ISO, and management objectives. This study did not address the operational efficiency of each initiative. This gives rise to attribution problem. The study also had senior administrative managers as respondents. There may be different results if the respondents were faculty, students, or staff at lower cadres. The study mitigated these by studying performance management as opposed to particular initiatives. The other major limitation is the input and output data used in DEA operational efficiency analysis. The study relied mainly on data from published financial reports and graduation booklets. A number of instances showed this data was significantly different from the data obtained from other sources. The study also

excluded diploma students and graduands from the analysis as this as per the Universities Act, 2012 is under technical vocational education and training and regulated by TVETA (Kongere, 2011) yet most universities have diplomas as a major output. The study recommends other studies to incorporate diploma students and diplomas awarded as an input and output respectively.

The other significant limitation was the exclusion of support and non-technical/ administrative staff in the computation of operational efficiency (Flegg et al., 2004). The study also is cognizant that most universities have an addendum of additional graduands to the graduation booklet that does not become part of the kept records and therefore there could be slight differences in the graduation numbers. In addition, some of the research done in the universities is not reflected in the annual published accounts. These research or grants amounts go directly to the researcher or departments and this may result in understatement of operational efficiency. There are also collaborations in research and consultancies that were not taken into account. The study to mitigate these limitations relied on data from published accounts which are based on legal frameworks.

### Suggestions for Further Research

This study established that 32.6% variation in operational efficiency is attributed to performance management. There is an opportunity for further research and exploration of the other antecedents of operational efficiency. This study also focused on operational efficiency but did not distinguish technical and scale efficiency as well as teaching and research efficiency in each university as opposed to the sector as a whole. The study does not consider the particular university's objectives, which influences how the factors under study are implemented. The study suggests addressing this shortcoming, especially in specialized universities. It is suggested that further exploration of social efficiency, which looks at aspects of customer and societal satisfaction, be undertaken.

Another recommended area of further study is the consideration of faculties and disciplines when computing operational efficiency. Cost and research incomes vary across different disciplines with universities offering medical and related courses having higher operational efficiency. This was not considered in this study and would be useful when considering operational efficiency of universities in Kenya.

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