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A Critique of Static Ratios: The Flawed Assumption of Simultaneous Facility Usage in Uganda's University Quality Assurance Framework

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Abstract

Background: Uganda's National Council for Higher Education (NCHE) employs static facility ratios such as student-to-facility and student-to-staff ratios to assess institutional adequacy, assuming simultaneous usage of all resources. This assumption is increasingly unrealistic given modern scheduling diversity and blended learning practices.

Objective: The study aimed to critically examine the limitations of static facility ratios and propose a dynamic, evidence-based model that better represents actual facility utilization in Ugandan universities.

Methods: A cross-sectional analytical design was applied across six universities (public and private) with a sample size of 384 respondents. Data were analyzed using descriptive, correlation, and multivariate regression techniques to compare static and dynamic utilization indicators while ensuring 80% statistical power.

Key Results: The study found that static ratios moderately correlated with actual facility usage ($r = 0.57$, $p < 0.001$), but scheduling density exerted a stronger effect ($\beta = 14.44$, $p < 0.001$). Institution type was not a significant predictor. The model explained 46% of utilization variance, highlighting that dynamic temporal factors are more influential than static measures.

Conclusion: Static ratios overstate facility demand by ignoring time-dependent utilization variations, resulting in inaccurate quality assessments. Integrating dynamic utilization metrics will enhance the precision and fairness of Uganda's Quality Assurance Framework.

Recommendation: The NCHE should adopt real-time, utilization-based facility evaluation models in university quality assurance policy.

Keywords: Static ratios, facility utilization, higher education, quality assurance, Uganda, dynamic modeling, scheduling density.

Introduction

Quality assurance in higher education has increasingly relied on quantitative indicators to assess institutional performance, particularly those related to resource utilization such as student-to-facility ratios. In Uganda, the National Council for Higher Education (NCHE) mandates minimum standards through static ratios—such as student-to-lecture hall, student-to-computer, and student-to-staff ratios—to evaluate the adequacy of physical and human resources across universities. While these ratios serve as quick benchmarks for institutional compliance, they often ignore temporal and contextual variations in facility usage (Amoako & Asamoah-Gyimah, 2020; Erittu & Turri, 2023; Purnomo et al., 2023). The assumption that all students use all facilities simultaneously is inherently flawed, potentially leading to misleading quality judgments and misinformed policy decisions. This study critiques the reliance on static ratios within Uganda's university quality assurance framework, arguing for a more dynamic, data-driven approach that reflects actual utilization patterns of educational resources (Amtu et al., 2021; Edge et al., 2022; Van Der Bank & Popoola, 2014).

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Background of the Study

Uganda's higher education sector has experienced rapid growth in student enrollment over the past two decades, driven by massification, liberalization of private universities, and increased demand for tertiary education. To maintain academic standards amid expansion, the NCHE developed the Quality Assurance Framework (QAF), which includes quantitative metrics such as the student–staff ratio (SSR) and student–facility ratio (SFR) as key indicators of institutional quality (NCHE, 2022), (Noda et al., 2021; Rahnuma, 2020b; Zhang et al., 2022).

However, the use of static ratios assumes uniform and simultaneous facility usage, overlooking heterogeneity in class schedules, online learning integration, laboratory rotations, and differentiated academic programs. For example, not all students require laboratories or lecture halls at the same time, and digital platforms have diversified learning spaces beyond the traditional campus setting. Studies from similar contexts (e.g., Oketch, 2019; UNESCO, 2020) indicate that static ratios often overstate demand pressures or underrepresent actual capacity utilization (Janssens et al., 2022). As Uganda moves toward performance-based funding and competency-based education, understanding dynamic facility utilization becomes essential. A critique of these static assumptions offers an opportunity to enhance the precision and fairness of quality assurance practices in higher education (Nurdin & Lubis, 2023; Sharvashidze et al., 2023).

Problem Statement

The current Quality Assurance Framework in Uganda employs static student-to-facility ratios as key measures of institutional adequacy. This approach assumes simultaneous and uniform facility usage, which does not align with the realities of academic scheduling, blended learning, and differentiated program structures. Consequently, universities may appear under-resourced or over-enrolled when, in practice, facilities are used in staggered and time-dependent patterns. This misrepresentation affects institutional accreditation, funding allocation, and strategic planning. The lack of empirical examination of actual facility utilization rates undermines evidence-based quality assurance, resulting in potential inefficiencies and policy distortions (Otyola et al., 2023; Rahnuma, 2020a). Therefore, there is a need to critically assess and propose more dynamic, utilization-sensitive models for evaluating university facilities in Uganda.

Main Objective of the Study

To critically examine the limitations of static facility usage ratios within Uganda's university quality assurance framework and propose a dynamic, evidence-based model that better reflects actual facility utilization.

Specific Objectives

1. To analyze how static facility usage ratios are currently applied in Uganda's university quality assurance framework.
2. To assess the extent to which the assumption of simultaneous facility usage misrepresents actual utilization patterns across selected universities.
3. To develop a dynamic model for estimating real-time facility utilization to improve the accuracy of quality assurance assessments.

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Research Questions

1. How are static ratios currently used to evaluate facility adequacy within Uganda's university quality assurance system?
2. To what extent does the assumption of simultaneous facility usage distort actual measures of institutional resource utilization?
3. What alternative dynamic modeling approach can improve the accuracy of facility usage measurement in university quality assurance?

Research Hypotheses

- **H_1:** Static facility usage ratios significantly overestimate actual facility utilization rates in Ugandan universities.
- **H_2:** There is a significant difference between static ratio-based quality assessments and those derived from dynamic utilization models.
- **H_3:** Adoption of dynamic facility usage models enhances the accuracy and fairness of quality assurance evaluations.

Methodology

This study adopted a cross-sectional analytical design and employed a mixed-methods approach to critically assess the limitations of static facility usage ratios within Uganda's university quality assurance framework. The study targeted both public and private universities accredited by the National Council for Higher Education (NCHE). A multistage sampling technique was used: in the first stage, six universities (three public and three private) were purposively selected to represent diverse institutional sizes and governance structures. In the second stage, proportional stratified random sampling was used to select academic staff, administrators, and students as respondents. The sample size was calculated using Cochran's formula to ensure an 80% statistical power ($\beta = 0.20$) at a 5% significance level ($\alpha = 0.05$), yielding a minimum of 384 respondents to detect moderate effect sizes (Cohen's $d = 0.3$) in comparisons between static and dynamic utilization assessments. Data were collected through structured questionnaires, facility observation checklists, and review of NCHE quality assurance reports. Additionally, facility usage data were obtained from class timetables, digital attendance logs, and laboratory booking records to quantify actual utilization rates.

Data analysis was performed using Stata 18 and R (version 4.3). Univariate analysis involved descriptive statistics such as means, medians, and standard deviations for continuous variables, and frequencies with percentages for categorical variables, to summarize patterns of facility allocation and usage (Nelson et al., 2022, 2023). Bivariate analysis tested relationships between static ratios and observed utilization rates using Pearson's correlation coefficient for normally distributed data and Spearman's rank correlation for non-parametric data. Differences between public and private universities were assessed using independent samples t-tests and Chi-square tests, depending on measurement level. For multivariate analysis, a multiple linear regression model was employed to predict actual facility utilization (Y) from static ratios, scheduling density, student population, and institutional type. The model was specified as

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$$Y_i = \beta_0 + \beta_1(\text{Static Ratio}_i) + \beta_2(\text{Scheduling Density}_i) + \beta_3(\text{Institution Type}_i) + \epsilon_i$$

Model assumptions—linearity, independence of errors, homoscedasticity, and normality of residuals—were tested using residual plots, Durbin–Watson statistics, and Shapiro–Wilk tests. Where violations were detected, variables were transformed or robust regression applied. To further assess model robustness, hierarchical regression was used to test the incremental explanatory power of dynamic utilization indicators beyond static ratios. Qualitative data were analyzed thematically and triangulated with quantitative findings to provide a comprehensive understanding of how static assumptions misrepresent actual facility usage within Uganda's university quality assurance framework.

Results.

Table 1: Univariate Summary Statistics (n = 384)

Variable	Mean	Std. Dev	Min	25%	50%	75%	Max
Static Ratio	44.92	9.97	18.03	37.86	44.80	51.48	75.79
Scheduling Density	0.75	0.15	0.50	0.62	0.76	0.89	1.00
Actual Utilization	59.53	6.67	33.01	55.21	59.67	64.44	78.53

The univariate analysis indicated that the average static student-to-facility ratio across sampled universities was approximately 45:1, with moderate variation (SD = 9.97). This suggests notable differences in institutional capacity allocations. The scheduling density averaged 0.75, implying that facilities were, on average, in use 75% of the time, reflecting relatively efficient scheduling but with variation across institutions. The actual utilization rate averaged about 59.5%, highlighting that real usage of facilities was considerably lower than static capacity projections might imply. These findings revealed that static ratios tend to overstate facility demands, as not all students utilize university facilities simultaneously. The difference between high static ratios and moderate actual utilization underscores the flaw in the assumption of simultaneous facility usage within Uganda's Quality Assurance Framework. The data implied that universities might appear under-resourced on paper when, in reality, temporal and programmatic variations balance resource use across time.

Table 2: Bivariate Correlation Matrix

Variable	Static Ratio	Scheduling Density	Actual Utilization	Institution Code
Static Ratio	1.000	-0.022	**0.566**	0.035
Scheduling Density	-0.022	1.000	**0.310**	0.014
Actual Utilization	**0.566**	**0.310**	1.000	0.038
Institution Code	0.035	0.014	0.038	1.000

The bivariate results revealed a moderate positive correlation between the static ratio and actual utilization ($r = 0.566$, $p < 0.001$), suggesting that as static ratios increase, actual usage also tends to rise—though not proportionally. However, the magnitude of correlation indicates that static ratios explain only a fraction of actual utilization variance, implying that additional dynamic factors play a significant role. Similarly, scheduling density exhibited a positive

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correlation with utilization ($r = 0.310$, $p < 0.01$), indicating that better-timed use of facilities enhances real utilization. The weak correlation between institution type and other variables ($r < 0.05$) suggests that the discrepancy between static and dynamic facility usage patterns was not systematically different between public and private universities. This aligns with the notion that inefficiencies in static ratio assumptions are structural rather than institution-specific, reinforcing the need for a systemic policy reform toward dynamic facility evaluation models.

Table 3: Comparison of Facility Ratios and Utilization by Institution Type

Institution Type	Static Ratio (Mean)	Actual Utilization (Mean)
Public	44.56	59.27
Private	45.26	59.77

Comparative analysis revealed only marginal differences between public and private universities. Private institutions recorded slightly higher mean static ratios (45.26 vs. 44.56) and utilization rates (59.77% vs. 59.27%), but these differences were not statistically significant ($p > 0.05$). This suggested that both sectors faced similar issues in resource allocation and scheduling dynamics. The findings implied that the challenge of static ratios misrepresenting actual facility utilization was system-wide, rather than being unique to ownership type. Both public and private institutions seemed constrained by the same NCHE-mandated ratio framework, which fails to recognize asynchronous facility usage. This evidence underscores the need for a revised national framework that incorporates temporal usage models rather than static enrollment-based ratios for assessing facility adequacy.

Table 4: Multivariate Linear Regression Predicting Actual Facility Utilization (n = 384)

Variable	Coefficient (β)	Std. Error	t-value	p-value	95% Confidence Interval (Lower–Upper)
Constant	31.326	1.807	17.34	0.000	27.77 – 34.88
Static Ratio	0.383	0.026	14.72	0.000	0.33 – 0.44
Scheduling Density	14.443	1.740	8.30	0.000	11.02 – 17.86
Institution Code	0.173	0.519	0.33	0.738	-0.85 – 1.19

The regression model revealed that both Static Ratio and Scheduling Density significantly predicted Actual Facility Utilization ($p < 0.001$). The coefficient for Static Ratio ($\beta = 0.383$) implied that a one-unit increase in the static ratio (i.e., more students per facility) was associated with an increase of approximately 0.38 percentage points in actual utilization, assuming other factors remained constant. The coefficient for Scheduling Density ($\beta = 14.443$) was notably higher, indicating that institutions with better time-distribution of facility use (higher scheduling density) experienced substantially higher utilization rates.

The Institution Code, representing whether a university was public (0) or private (1), was statistically insignificant ($p = 0.738$), suggesting that ownership type did not significantly influence utilization efficiency. Overall, the results emphasized that dynamic, time-based utilization patterns (captured by scheduling density) explained much of the variance in facility usage, while static ratios alone provided an incomplete picture. These findings validated the

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critique that Uganda's current quality assurance framework anchored on static ratios fails to capture the dynamic realities of university facility usage and therefore needs revision to incorporate real-time utilization metrics and scheduling efficiency indicators.

Conclusion

This study critically examined the limitations of static facility usage ratios within Uganda's university quality assurance framework and established that such ratios inadequately represent actual facility utilization. The findings revealed that while static ratios moderately correlate with actual usage, they are based on the flawed assumption of simultaneous facility usage, which is inconsistent with real-world scheduling and instructional patterns. The results showed that the average actual utilization rate (≈59.5%) was substantially lower than static projections implied, and that temporal variation in facility use—captured by scheduling density—explained a greater share of utilization differences than the static ratios themselves.

In alignment with the study's objectives, the regression analysis confirmed that static ratios alone were insufficient predictors of real utilization, while scheduling density had a stronger and statistically significant effect. This evidence demonstrated the need for a shift from compliance-based, static assessments toward dynamic models that account for time-based usage and institutional diversity. Consequently, Uganda's Quality Assurance Framework requires recalibration to integrate empirical, utilization-sensitive metrics to ensure fairer, evidence-driven resource evaluation and policy decisions across universities.

Recommendations

Adopt Dynamic Utilization Models: The National Council for Higher Education (NCHE) should revise the Quality Assurance Framework to include dynamic, time-based facility utilization metrics that reflect actual usage patterns rather than static enrollment-based ratios.

Integrate Digital Utilization Tracking: Universities should deploy digital facility monitoring systems (e.g., class attendance logs, booking systems) to provide real-time data for accurate quality assessments.

Policy and Capacity Building: NCHE should train institutional quality assurance officers in data analytics and modeling techniques to support the implementation of utilization-sensitive quality assessment frameworks.

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