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# PROCESS MANAGEMENT PRACTICES AND THEIR INFLUENCE ON THE STRATEGIC COMPETITIVENESS OF DIAGNOSTIC LABORATORIES IN NAKURU COUNTY, KENYA

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## ABSTRACT

Effective process management is central to and plays a critical role in enhancing the operational efficiency and strategic competitiveness of diagnostic laboratories. Despite its importance, empirical evidence on how process documentation, monitoring, and standardization shape competitiveness in lowand middle-income settings remains limited. This study examined the influence of process management practices on the strategic competitiveness of diagnostic laboratories in Nakuru County, Kenya.A cross-sectional analytical study was conducted among 38 respondents drawn from public and private diagnostic laboratories. Data were collected using structured questionnaires and supplemented with qualitative insights from open-ended responses. Descriptive statistics, chi-square tests, and Pearson correlations were used to analyze quantitative data. Key process management variables included QMS documentation, process review frequency, performance metrics, communication practices, improvement pathways, and stakeholder interfaces. Strategic competitiveness was assessed through perceived quality, customer satisfaction, and financial indicators. Adoption of process management practices was high, with 90.5% of laboratories implementing documented QMS and all maintaining written procedures. Metrics availability showed strong correlations with monitoring frequency ($r = .726$, $p < .01$), communication frequency ($r = .715$, $p < .01$), and pursuit of improvements ($r = .645$, $p < .01$). Documented QMS significantly predicted the use of structured stakeholder feedback systems ($\chi^2 = 13.263$, $p = .004$, $\varphi c = .795$) and ROI monitoring ($\chi^2 = 5.185$, $p = .023$, $\varphi c = .509$). Qualitative responses highlighted challenges such as outdated SOPs, workload pressure, and limited infrastructure. Nonetheless, standardized processes, regular reviews, and clear communication were reported to enhance reliability, compliance, and stakeholder confidence. Overall, 90.4% of laboratories rated their quality performance as "Good" or "Excellent.Strong process management practices including documentation, regular monitoring, structured improvement, and stakeholder engagement significantly enhance strategic competitiveness.

Strengthening digital documentation systems, increasing review frequency, and addressing contextual resource constraints can further improve performance and sustainability.

**Keywords:** Process management practices, Strategic competitiveness, Quality management systems, Diagnostic laboratories, Operational efficiency, Kenya

## INTRODUCTION

Diagnostic laboratories occupy a central position in modern healthcare systems by providing accurate and timely test results that underpin clinical decision-making, disease surveillance, and patient management. As healthcare demand intensifies and competition among service providers increases, diagnostic laboratories are under growing pressure to deliver high-quality services efficiently, reliably, and at competitive cost. In this context, process management practicesdefined as the systematic design, control, monitoring, and continuous improvement of organizational workflowshave emerged as a critical determinant of laboratory performance and long-term competitiveness (Hidayah et al., 2022; Ramadhanty, 2023).

Process management practices form a core pillar of Total Quality Management (TQM) but warrant distinct analytical attention because they directly shape operational efficiency, error reduction, turnaround time, and service consistency. In diagnostic laboratories, key process management elements include workflow standardization, documentation of procedures, performance measurement, root-cause analysis, and continuous process improvement (Steinmann et al., 2018). When effectively implemented, these practices enable laboratories to minimize inefficiencies, reduce diagnostic errors, optimize resource utilization, and respond more effectively to client and regulatory demands.

Globally, healthcare organizations that have invested in structured process management have demonstrated measurable gains in service quality and competitiveness. The World Health Organization reports that laboratories applying standardized process controls and continuous improvement mechanisms have achieved significant reductions in diagnostic errors and improved turnaround times (Aburayya, 2020; WHO, 2020). In Europe and North America, process-oriented quality systems have been associated with improved operational reliability, enhanced customer satisfaction, and sustained competitive advantage in laboratory services (Zehir & Zehir, 2023).

Across Africa, evidence suggests that laboratories adopting structured process management practices outperform those relying on ad hoc or reactive operational approaches. Studies from South Africa, Nigeria, and Ghana indicate that laboratories with clearly defined workflows, routine performance monitoring, and continuous improvement mechanisms report lower error rates, improved patient satisfaction, and greater operational stability (Maphumulo & Bhengu, 2019; Egwunatum et al., 2021; Kploanyi et al., 2023). However, the adoption of these practices remains uneven, constrained by resource limitations, skills gaps, and weak institutional quality cultures.

In Kenya, disparities in laboratory performance across counties have been partly attributed to differences in the maturity of internal process management systems. While laboratories in major urban centers such as Nairobi have made notable progress in standardizing workflows and performance monitoring, others continue to experience inefficiencies, prolonged turnaround times, and inconsistent service quality (Ministry of Health, 2022; Omore, 2022). Nakuru County reflects this mixed landscape. Although some leading laboratoriessuch as Nakuru County Referral Hospital Laboratory and selected private facilitieshave implemented structured process controls, many smaller laboratories struggle with fragmented workflows, limited documentation, and weak continuous improvement mechanisms (Kutol, 2022; Oyoo, 2015).

Strategic competitiveness in diagnostic laboratories extends beyond technical accuracy to include efficiency, responsiveness, innovation, cost control, and customer satisfaction (Kadira, 2022; Adekoya, 2025). Process management practices are central to achieving these outcomes because they translate quality intentions into day-to-day operational performance. Despite their importance, empirical evidence on how process management practices influence the strategic competitiveness of diagnostic laboratories in Nakuru County remains limited. This study therefore sought to evaluate the influence of process management practices on the strategic competitiveness of selected diagnostic laboratories in Nakuru County, Kenya.

## MATERIALS AND METHODS

### Study Location

The study was conducted in selected diagnostic laboratories within Nakuru County, Kenya. Nakuru County was purposively selected because it is a major healthcare hub in Kenya's Rift Valley region, hosting a diverse mix of public, faith-based, and private diagnostic laboratories. The county serves both urban and rural populations and has experienced rapid growth in healthcare demand, making it an appropriate setting for examining how internal process management practices influence laboratory competitiveness. Additionally, the presence of laboratories at varying levels of process maturity provided an ideal context for comparative analysis.

### Study Design

The study adopted a mixed-methods approach using a convergent parallel design. Quantitative and qualitative data were collected concurrently, analyzed independently, and integrated during interpretation. This design was chosen to enable a comprehensive assessment of process management practices by combining measurable indicators of implementation with in-depth managerial and technical perspectives. Quantitative data captured the extent of process management practices and strategic competitiveness, while qualitative data provided contextual explanations on how and why these practices influence laboratory performance.

### Study Population

The target population comprised laboratory personnel working in the selected diagnostic laboratories, including operational staff, quality officers, heads of sections, and laboratory managers. For the quantitative component, the population focused on operational and technical staff directly involved in laboratory workflows and process execution. The qualitative component targeted managerial and supervisory staff responsible for process design, quality management, and strategic decision-making.

Inclusion criteria required participants to be employees of diagnostic laboratories registered with the Kenya Medical Laboratory Technicians and Technologists Board (KMLTTB), have a minimum of one year of continuous service in the respective laboratory, and provide informed consent. Employees with less than one year of service and those who declined consent were excluded, as they were deemed to have insufficient exposure to laboratory process management systems.

**Sample Size Determination**

For the quantitative component, a total sample of 48 respondents was drawn from a target population of 83 laboratory personnel across the five laboratories. Proportionate allocation was applied based on laboratory size to ensure fair representation. For the qualitative component, sample size was guided by data saturation. Key informantsincluding laboratory managers and quality officerswere purposively selected, with interviews conducted until no new themes emerged. Saturation was achieved within the recommended range of 10–30 participants for qualitative inquiry.

**Data Collection Instruments**

Data were collected using structured questionnaires and semi-structured interview guides. The questionnaire targeted operational staff and captured data on process documentation, workflow standardization, performance measurement, continuous process improvement, and perceived strategic competitiveness. The interview guide targeted managers and quality officers and explored deeper insights into process management practices, implementation challenges, leadership support, and competitiveness strategies. Instrument validity was ensured through expert review and pilot testing in comparable laboratories outside Nakuru County.

**Data Collection Procedure**

Data collection commenced after obtaining ethical and administrative approvals. Eligible participants were identified, briefed on the study objectives, and provided informed consent. Questionnaires were administered through physical visits and, where necessary, electronically using secure online forms. Qualitative interviews were conducted through scheduled face-to-face sessions in private settings within the laboratories to ensure confidentiality and openness.

**Data Analysis**

Quantitative data were coded and analyzed using SPSS version 25. Descriptive statistics summarized the level of process management practices, while correlation and multiple regression analyses examined the influence of these practices on strategic competitiveness. Qualitative data

were transcribed verbatim and analyzed thematically using content and discourse analysis to identify recurring patterns related to process efficiency, leadership, and competitiveness.

## RESULTS

### Process Documentation and Accessibility in Diagnostic Laboratories

The results indicate a high level of process formalization across the participating diagnostic laboratories. Nearly all laboratories had documented core processes, with most operating within an established Quality Management System (QMS). Process review cycles were predominantly annual, while access to documentation was achieved through a mix of printed manuals and digital repositories. These findings demonstrate that standardized and accessible process documentation is well institutionalized, forming a foundational element of process management and enabling consistent service delivery, audit readiness, and operational reliabilitykey contributors to strategic competitiveness.

**Table 1:** *Process Documentation, Review Frequency, and Accessibility*

| Variable | Category | n | % |
|---|---|---|---|
| Documented QMS | Yes | 34 | 90.5 |
| | No | 4 | 9.5 |
| Documented processes | Yes | 38 | 100 |
| Review/update frequency | Quarterly | 7 | 19.0 |
| | Annually | 20 | 52.4 |
| | As needed | 11 | 28.6 |
| Access to documents | Printed copies | 15 | 39.1 |
| | Central repository/intranet | 12 | 32.3 |
| | Shared drives | 9 | 23.8 |
| | Not easily accessible | 2 | 4.8 |

### Performance Measurement and Communication Practices

Performance measurement practices were moderately to strongly embedded within laboratory operations. Nearly half of the laboratories had established metrics across all processes, while most conducted regular monitoring and communicated results internally. These practices indicate a shift toward data-informed process control, which enhances responsiveness, accountability, and

coordinationcritical elements of operational efficiency and competitive advantage in diagnostic services.

**Table 2:** *Establishment, Monitoring, and Communication of Performance Metrics*

| Variable | Category | n | % |
|---|---|---|---|
| Metrics established | All processes | 18 | 47.6 |
| | Some processes | 16 | 42.9 |
| | None | 4 | 9.5 |
| Monitoring cadence | Monthly | 9 | 23.9 |
| | Quarterly | 13 | 33.3 |
| | Annually | 13 | 33.3 |
| Communication frequency | Regular | 16 | 42.9 |
| | Occasional | 16 | 42.9 |
| | Not communicated | 6 | 14.2 |

**Continuous Improvement Mechanisms and Stakeholder Engagement**

Most laboratories actively pursued continuous improvement, primarily driven by internal audits and structured evaluation processes. The majority had defined improvement methodologies, although stakeholder engagement remained largely internal, dominated by management and staff participation. Laboratories with regular improvement cycles and structured methodologies demonstrated stronger process control and adaptability, reinforcing their ability to sustain quality, meet accreditation requirements, and remain competitive.

**Table 3:** *Improvement Identification, Methodologies, and Stakeholder Interfaces*

| Variable | Category | n | % |
|---|---|---|---|
| Pursuit of improvements | Regularly | 20 | 52.4 |
| | Occasionally | 16 | 42.9 |
| Improvement identification | Process audits | 21 | 57.1 |
| | Customer feedback | 11 | 28.6 |
| Methodology in place | Defined & followed | 25 | 66.7 |
| | Inconsistent | 11 | 28.2 |
| Primary stakeholders | Management | 16 | 42.9 |
| | Employees | 14 | 38.1 |
| Communication quality | Regular | 22 | 57.1 |
| | Inconsistent | 16 | 42.9 |

### Root Cause Analysis and Process Standardization

Root Cause Analysis (RCA) was widely practiced, with most laboratories applying it consistently or occasionally. The use of structured analytical tools such as the 5 Whys and Fishbone diagrams was common, and all laboratories reported at least partial process standardization. These practices were strongly associated with improved service quality, ISO compliance, and financial performance, underscoring RCA and standardization as strategic enablers of competitiveness.

**Table 4:** *Root Cause Analysis Practices and Process Standardization*

| Variable | Category | n | % |
|---|---|---|---|
| RCA frequency | Consistently | 16 | 42.9 |
| | Occasionally | 20 | 52.4 |
| RCA tools | 5 Whys | 20 | 52.4 |
| | Fishbone | 18 | 47.6 |
| Process standardization | Extensive | 16 | 42.9 |
| | Some extent | 22 | 57.1 |

### Data-Driven Decision-Making and Strategic Outcomes

Data-driven decision-making practices were increasingly evident, with laboratories relying on hybrid data collection systems and routinely visualizing performance metrics. Turnaround time emerged as the dominant performance indicator. Laboratories that extensively used data-driven metrics demonstrated significantly higher quality ratings, stronger financial monitoring, improved customer satisfaction, and enhanced ISO adherenceconfirming the strategic value of analytics-enabled process management.

**Table 5:** *Performance Metrics Employed*

| Metric | n | % |
|---|---|---|
| Turnaround time (TAT) | 29 | 76.2 |
| Accuracy rate | 16 | 42.9 |
| Productivity measures | 11 | 28.6 |
| Error rates | 11 | 28.6 |
| Degree of DDDM use | Extensive / Some extent | 38 |

### Association Between Process Management Practices and Strategic Competitiveness

Statistical analysis revealed strong and significant relationships between process management practices and strategic competitiveness indicators. Availability of performance metrics, monitoring frequency, structured improvement methodologies, and RCA implementation were positively associated with service quality, ISO compliance, customer satisfaction, revenue monitoring, and financial sustainability. These results confirm that process management practices are not merely operational tools but strategic assets that directly influence laboratory competitiveness.

**Table 6:** *Process Metrics and Effectiveness*

| **Relationship** | **r** | **p** |
|---|---|---|
| Metrics availability × Monitoring frequency | .726 | < .01 |
| Metrics availability × Communication frequency | .715 | < .01 |
| Metrics availability × Pursuit of improvements | .645 | < .01 |
| Pursuit of improvements × Structured methodology | .678 | < .01 |

## DISCUSSION

The findings of this study demonstrate that process management practices are a central determinant of the strategic competitiveness of diagnostic laboratories in Nakuru County, Kenya. The results show that laboratories with well-documented processes, clearly defined performance metrics, structured continuous improvement mechanisms, and consistent use of data-driven decision-making exhibit superior performance in service quality, operational efficiency, customer satisfaction, and regulatory compliance. These outcomes confirm that process management is not merely an operational necessity but a strategic capability that enables diagnostic laboratories to sustain competitiveness in an increasingly demanding healthcare environment.

The high prevalence of documented quality management systems and standardized processes across the laboratories reflects a growing institutional recognition of the importance of formal process control. This aligns with prior studies that have established process documentation as a foundation for reliability and error reduction in laboratory services (Oakland, 2019; Zehir&Zehir, 2023). Similar findings have been reported in South African and Nigerian diagnostic laboratories, where standardized workflows were associated with reduced diagnostic variability and improved turnaround times (Van Moll et al., 2023; Egwunatum et al., 2021). In the Nakuru context, the universal documentation of core processes suggests that laboratories have achieved a baseline level of process maturity, which enhances consistency, audit readiness, and accreditation compliance. However, the variation in review frequency and accessibility of documentation indicates that documentation alone is insufficient unless it is actively maintained and integrated into daily operations.

Performance measurement and internal communication of metrics emerged as critical drivers of competitiveness. Laboratories that monitored and shared performance data more frequently

demonstrated stronger process control and organizational alignment. This finding is consistent with Kaplan and Norton's (2001) balanced scorecard theory, which emphasizes the strategic role of performance metrics in translating operational activities into competitive outcomes. Comparable studies in European and Asian healthcare systems have shown that laboratories that routinely track indicators such as turnaround time, error rates, and productivity are better positioned to optimize resource use and respond to service demands (Aburayya, 2020; Hidayah et al., 2022). The strong correlations observed in this study between metric availability, monitoring frequency, and improvement initiatives reinforce the argument that what gets measured and communicated is more likely to be improved, ultimately strengthening competitive positioning.

Continuous improvement practices and structured problem-solving approaches further distinguished competitively positioned laboratories from less mature ones. The widespread use of internal audits and defined improvement methodologies mirrors findings from earlier research demonstrating that continuous improvement systems such as PDCA and Kaizen foster organizational learning and resilience (Steinmann et al., 2018; Ramadhanty, 2023). The dominance of management and internal staff as primary stakeholders in improvement initiatives suggests a largely inward-facing improvement culture. While this internal focus supports operational refinement, it may limit the incorporation of external perspectives such as patient feedback and clinician expectations, which are increasingly recognized as critical sources of competitive intelligence in healthcare (Khatab, 2021). Expanding stakeholder engagement could therefore further enhance strategic responsiveness and market relevance.

The consistent application of root cause analysis and process standardization underscores the role of analytical rigor in sustaining quality and competitiveness. Laboratories that systematically applied tools such as the 5 Whys and Fishbone diagrams reported better outcomes in service quality, ISO compliance, and financial monitoring. These findings align with prior empirical evidence linking root cause analysis to reduced error recurrence and improved process stability in clinical laboratories (Diamond, 2015; Kadira, 2022). The positive association between standardization and competitiveness also supports process-based views of strategy, which argue that competitive advantage in service organizations often arises from the disciplined execution of repeatable, high-quality processes rather than from differentiation alone.

The increasing reliance on data-driven decision-making emerged as one of the most significant strategic enablers. Turnaround time was identified as the dominant performance metric, reflecting its central role in clinician satisfaction and patient outcomes. Laboratories that extensively used data analytics and performance dashboards demonstrated higher quality ratings, improved financial oversight, and stronger customer satisfaction. These findings are consistent with global trends showing that healthcare organizations that integrate analytics into operational and strategic decision-making outperform those that rely on intuition or static protocols (Adekoya, 2025; WHO, 2020). However, the heavy reliance on hybrid data systems suggests transitional maturity, where laboratories are moving toward analytics-driven management but have not yet fully institutionalized advanced digital solutions.

The implications of these findings are substantial for both practice and policy. First, they confirm that process management practices directly shape strategic competitiveness in diagnostic laboratories, particularly in resource-constrained settings. Second, they highlight that investments in process documentation, performance measurement, continuous improvement, and analytics yield returns not only in quality outcomes but also in financial sustainability and market positioning. Third, the findings suggest that regulatory and accreditation bodies should move beyond compliance checks to actively promote process management maturity as a strategic priority for laboratory services.

## CONCLUSION

In conclusion, this study demonstrates that process management practices significantly influence the strategic competitiveness of diagnostic laboratories in Nakuru County. Laboratories that systematically document processes, measure and communicate performance, pursue continuous improvement, apply root cause analysis, and use data-driven decision-making achieve superior competitive outcomes. These practices collectively transform operational efficiency into a sustainable strategic advantage.

## RECOMMENDATION

Diagnostic laboratories should institutionalize comprehensive process management frameworks by strengthening performance analytics, formalizing continuous improvement structures, and expanding stakeholder engagement. Such strategic investments will enhance service quality, regulatory compliance, and long-term competitiveness within Kenya's evolving healthcare landscape.

# DECLARATIONS

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**This research received no external funding.**

**Conflict of Interest Statement**
The authors declare no conflict of interest**,**

**Data Availability Statement**
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

**Author Contributions**
Walekhwa: Conceptualization, Methodology and data analysis
Kipchumba: Review & Editing
Kiplagat: Review & Editing

**Ethical Approval**

Ethical approval was obtained from the Kabarak University Research Ethics Committee, and a research permit was issued by NACOSTI. Participation was voluntary, informed consent was obtained, and confidentiality was maintained through anonymization and secure data storage. The study adhered to national and institutional ethical guidelines and no conflicts of interest were declared.



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