Proceedings of the International Conference on Industrial Engineering and Operations Management

Publisher: IEOM Society International, USA DOI: 10.46254/SA07.20260177
Published: August 4, 2026

The Relationship Between an ISO 17025:2017 Accredited Laboratory and Operational Performance: A Case of Perishable Product Export Control Board (PPECB) Testing Laboratory

Gcinumuzi Zimu
Master of Philosophy in Quality Management Student
Department Of Operations and Quality Management
Faculty of Management Sciences
Durban University of Technology
Durban, South Africa
22290477@dut4life.ac.za

Shalini Singh
Associate Professor
Department of Operations and Quality Management
Faculty of Management Sciences
Durban University of Technology
Durban, South Africa
shalinis@dut.ac.za

Anisha Ananth
HoD Department of Statistics
Department of Statistics
Durban University of Technology
Durban, South Africa
anishas@dut.ac.za

Abstract

ISO 17025:2017 is a standard that defines requirements for testing and calibration laboratories to ensure accurate results. This study examines the relationship between ISO 17025 accreditation and laboratory operational performance, identifying key performance indicators (KPIs) through a mixed methods approach involving questionnaires and interviews at the Perishable Product Export Control Board Testing laboratory. Reliability testing yielded a Cronbach's Alpha of 0.89, ensuring clarity and reliability of questions. The findings indicate a significant relationship between ISO accreditation and operational performance, though no significant impact on proficiency testing results was observed. Future research should compare operational efficiency in similar laboratories before and after accreditation.

Keywords
Accreditation, ISO 17025:2017, operational performance and Proficiency testing.

1. Introduction
In an increasingly globalised and highly regulated business environment, laboratories are under sustained pressure to demonstrate competence, reliability, and operational efficiency. As a result, quality management systems

© IEOM Society International

(QMSs) have become strategic tools for achieving operational excellence, enhancing customer confidence, and ensuring compliance with international standards (Chountalas, Magoutas and Zografaki, 2020; Rodriguez-Arnaldo and Martínez-Lorente, 2021). Among these systems, laboratory accreditation plays a particularly critical role in sectors where analytical accuracy, traceability of results, and regulatory compliance are non-negotiable requirements.

ISO/IEC 17025:2017 is the internationally recognised standard that specifies the general requirements for the competence of testing and calibration laboratories. It provides a structured framework addressing both technical and management requirements to ensure that laboratory results are accurate, reliable, and valid (ISO, 2017). Accreditation to ISO 17025 is widely regarded as a benchmark for laboratory competence and is frequently used by regulators, customers, and international trading partners as a basis for accepting analytical results (Rao, 2021; Radev, 2018).

Beyond regulatory compliance, ISO 17025 accreditation is increasingly viewed as a strategic mechanism for improving laboratory operational performance. Prior studies associate accreditation with improvements in quality culture, customer satisfaction, process standardisation, and risk management, alongside enhanced organisational credibility and market competitiveness (Geronimo et al., 2020; Panagiotidou et al., 2024). Accreditation also facilitates access to international markets by reducing technical trade barriers and promoting mutual recognition of test results (Bagodi, 2020; Ross and Neuteboom, 2022).

Despite these anticipated benefits, the empirical evidence regarding the operational impact of ISO 17025 accreditation remains inconclusive. While several studies report improvements in reliability, efficiency, and customer confidence following accreditation, others suggest that performance gains are inconsistent or marginal, particularly where accreditation is pursued primarily for compliance or market legitimacy rather than continuous improvement (Sadikoglu and Temur, 2012; Okezue et al., 2020). These mixed findings indicate that the relationship between ISO 17025 accreditation and laboratory performance is complex and influenced by contextual factors such as organisational size, resource availability, management commitment, and employee engagement (Panadigiotidou et al.,2025)

In South Africa, testing laboratories operating within regulated sectors such as food safety play a vital role in safeguarding public health and supporting export markets. The Perishable Product Export Control Board (PPECB) operates ISO 17025-accredited testing laboratories that provide analytical services for perishable food products destined for international markets. Given the stringent requirements of export certification, the operational performance of such laboratories is critical to both regulatory compliance and economic sustainability (PPECB, 2015). Against this backdrop, this study examines the relationship between ISO 17025:2017 accreditation and operational performance within a PPECB testing laboratory. Particular emphasis is placed on key performance indicators (KPIs) commonly used to evaluate laboratory performance, including customer satisfaction, customer complaints, non-conformances, and proficiency testing outcomes. By adopting a mixed-methods approach, the study seeks to contribute empirical evidence to the ongoing debate regarding the tangible operational value of ISO 17025 accreditation.

2. Problem Statement

ISO 17025:2017 accreditation is widely promoted as a mechanism for improving laboratory competence, service quality, and operational efficiency. However, achieving and maintaining accreditation is both resource-intensive and organisationally demanding. Laboratories are required to invest significantly in staff training, infrastructure upgrades, documentation systems, proficiency testing participation, and ongoing internal and external audits (Barradas and Sampaio, 2017; Merimi et al., 2020). Numerous challenges have been associated with the accreditation process, including high financial costs, extensive documentation requirements, increased administrative workload, time constraints, and resistance to change among employees (Andargie, 2019; Wagh, 2023). These challenges are particularly pronounced in laboratories operating within resource-constrained environments, such as those in developing economies, where limited financial and technical capacity may hinder the realisation of accreditation benefits (Okezue et al., 2020; Kaydos, 2020).

Critically, while ISO 17025 accreditation is expected to enhance operational performance, the extent to which these improvements are systematically realised and measurable remains uncertain. Much of the existing literature focuses on the perceived advantages of accreditation such as improved credibility and compliance without adequately linking these benefits to quantifiable performance outcomes (Radev, 2018; Harzli, 2021). There is limited empirical evidence demonstrating how accreditation influences specific operational metrics such as

© IEOM Society International

customer satisfaction levels, complaint frequency, rates of non-conformance, and proficiency testing performance over time.

Additionally, it is purported that certain laboratories implement ISO 17025 accreditation as a means of satisfying external market or regulatory requirements, rather than as a genuine tool for continuous improvement. Such superficial implementation may result in compliance-driven behaviour that fails to translate into meaningful operational gains and may even constrain efficiency due to bureaucratic overheads (Sadikoglu and Temur, 2012; Ross and Neuteboom, 2022). Within the South African context, and specifically within the PPECB testing laboratory environment, there is a paucity of empirical research examining whether ISO 17025:2017 accreditation meaningfully improves operational performance. Given the substantial investment required for accreditation and the strategic importance of laboratory performance in the perishable products export value chain, it is essential to establish whether the benefits of accreditation justify its associated costs and organisational demands.

Therefore, the core problem addressed in this study is the lack of clear empirical evidence on the relationship between ISO 17025:2017 accreditation and operational performance in testing laboratories. More specifically, it remains unclear whether accreditation leads to measurable improvements in key performance indicators, namely customer satisfaction, customer complaints, non-conformances, and proficiency testing outcomes within an ISO 17025-accredited PPECB testing laboratory.

3. Methodology

3.1. Research design

This paper adopts a mixed-methods research approach using an explanatory sequential design, in which quantitative data collection and analysis preceded, and informed, the qualitative phase. This design allowed the researcher to first identify general trends and relationships quantitatively and then to obtain in-depth explanations of these findings through qualitative enquiry (Creswell, 2009; McCrudden and McTigue, 2019). The approach is appropriate for studies investigating complex organisational phenomena such as the relationship between ISO/IEC 17025:2017 accreditation and laboratory operational performance, where both measurable performance indicators and human experiences are critical (Dawadi, Shrestha and Giri, 2021).

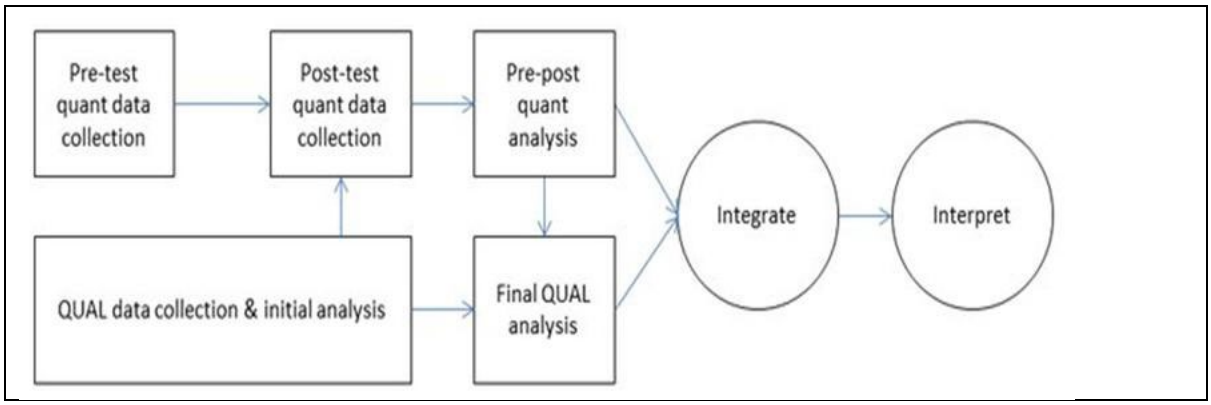


Figure 1. Adapted from Creswell (2009) and Somerville (2014)

In the design in Figure 1, the paper begins with a quantitative phase (such as surveys or numerical performance data) to identify patterns, relationships, or significant trends. Once these results are established, a qualitative phase (such as interviews or open-ended discussions) is conducted to explore why those results occurred and how participants understand or experience them.

3.2. Research setting and population

This paper was set at the Perishable Product Export Control Board (PPECB) testing laboratory in South Africa, an ISO/IEC 17025:2017 accredited laboratory**.** The target population comprised all 38 laboratory employees**,** including analysts, technicians, administrators, quality personnel, and management. Given the modest size of the population, total population sampling (census sampling) was employed for the quantitative phase to ensure comprehensive representation and to minimise sampling bias (Fife-Schaw, 2020).

© IEOM Society International

3.3. Quantitative research phase

3.3.1 Data collection instrument

Quantitative data was collected using a self-administered structured questionnaire consisting exclusively of closed-ended questions measured on a five-point Likert scale (from strongly disagree to strongly agree). The questionnaire comprised five sections:

- Section A: Demographic and organisational characteristics
- Section B: Customer satisfaction
- Section C: Quality performance post-accreditation
- Section D: Employee involvement in the quality management system
- Section E: Quality tools applied within the laboratory

The instrument was designed based on ISO 17025 requirements, key performance indicators (KPIs) reported in the literature, and the objectives of the study (Sadikoglu and Temur, 2012; Okezue et al., 2020).

3.3.2 Pilot Study and Reliability

A pilot study was conducted with five management representatives to assess clarity, relevance, completion time, and construct reliability. Feedback resulted in refinement of wording, elimination of redundant items, and adjustment of the estimated completion time to approximately 20 minutes. Reliability was assessed using Cronbach's alpha, yielding a coefficient of $\alpha = 0.89$, which indicates good internal consistency (George and Mallery, 2003; Amirrudin, Nasution and Supahar, 2020).

3.4. Qualitative research phase

3.4.1 Sampling

The qualitative phase employed purposive sampling, targeting individuals with extensive operational and strategic insight into the laboratory's quality management system. A total of ten semi-structured interviews were conducted with: Laboratory managers, Senior analysts,Laboratory administrators and General management. This ensured that participants possessed sufficient experience with ISO 17025 implementation and operational performance monitoring (Saunders, Lewis and Thornhill, 2009). The paper adopted a dual sampling strategy consistent with an explanatory sequential mixed-methods design. In the quantitative phase, Total population sampling was applied, with all 38 employees of the ISO/IEC 17025:2017-accredited PPECB testing laboratory invited to participate in the questionnaire survey. Total population sampling was deemed appropriate due to the small, well-defined population and its direct exposure to the laboratory's quality management system, thereby minimising sampling bias and enhancing representativeness (Saunders, Lewis and Thornhill, 2019; Fife-Schaw, 2020). Although the final response rate yielded between 25 and 28 completed questionnaires, the sample remained demographically and occupationally representative of the population. For the qualitative phase, purposive sampling was employed to select 10 information-rich participants from laboratory and senior management, based on their experience with ISO 17025 implementation, audits, and operational performance monitoring. This non-probability approach enabled the collection of in-depth contextual insights required to explain the quantitative findings (Etikan, Musa and Alkassim, 2016; Creswell and Plano Clark, 2018). The combined use of Total population and purposive sampling facilitated methodological complementarity, strengthened triangulation, and enhanced the overall credibility of the study.

4. Results

4.1. Overview of respondents

Quantitative data were collected from between 25 and 28 respondents out of a total population of 38 employees at the ISO/IEC 17025:2017-accredited PPECB testing laboratory as shown in Figure 2. The respondents represented a cross-section of laboratory personnel, including technicians, analysts, senior analysts, quality staff, and management.

© IEOM Society International

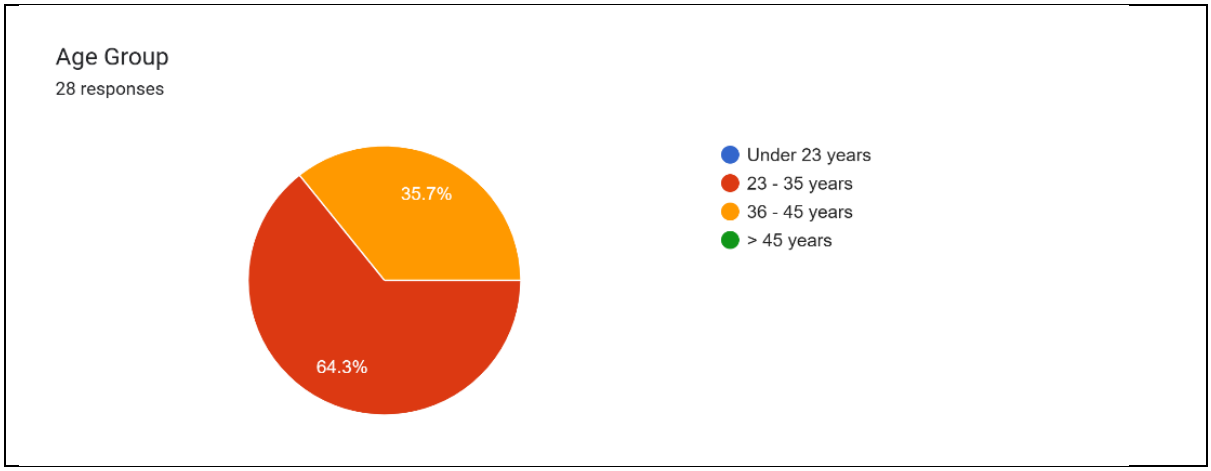


Figure 2. Age group of respondents

The demographic profile indicated a relatively young workforce, with the majority aged between 23 and 45 years, and an almost balanced gender distribution. Respondents possessed appropriate academic qualifications, predominantly diplomas and bachelor's degrees, with a notable proportion holding postgraduate qualifications. This distribution suggests adequate technical capacity to engage meaningfully with the laboratory's quality management system (QMS). According to Gupta and Sehgal (2021), young people contribute new perspectives, technological savvy, and adaptability to quality management systems, which can result in enhanced innovation, efficiency, and a more motivated workforce. The PPECB laboratory may benefit from Yuldashov's (2021) suggestion that young people employ system thinking techniques while tackling complex issues.

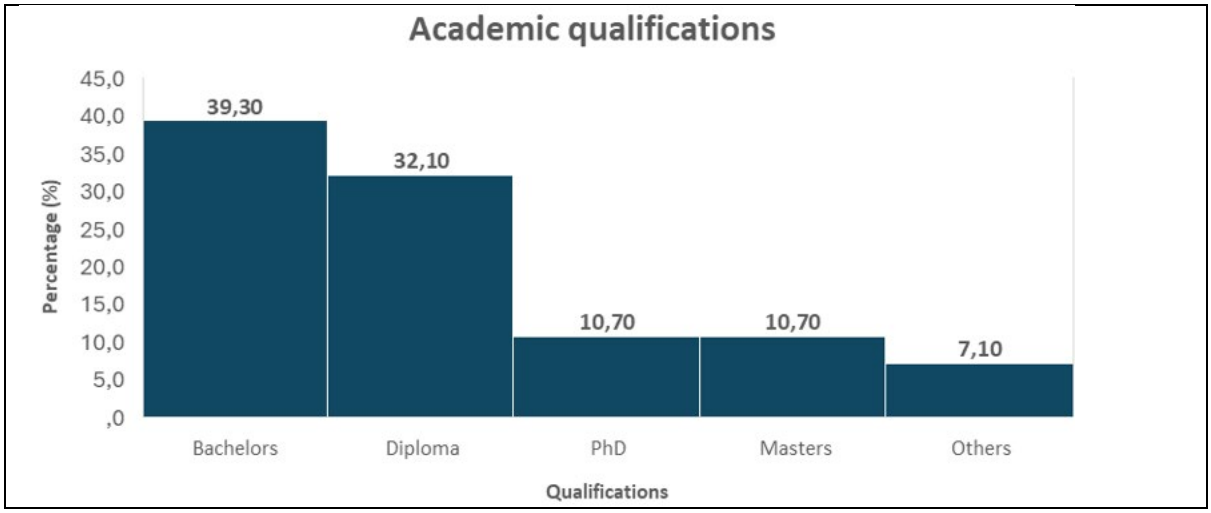


Figure 3. Academic qualifications of respondents

The analysis of respondents' academic qualifications indicates that the PPECB testing laboratory is staffed by a well-qualified workforce capable of supporting and sustaining an ISO/IEC 17025:2017 quality management system. Figure 3 shows that the largest proportion of respondents held bachelor's degrees (approximately 39%), followed by those with national diplomas (about 32%). A notable proportion of respondents possessed postgraduate qualifications, with approximately 11% holding master's degrees and a further 11% holding doctoral degrees, while a small percentage reported other relevant professional qualifications. This distribution demonstrates a strong balance between practical laboratory training and advanced academic expertise. Such a qualifications profile is critical in accredited laboratory environments, as higher education levels are associated with improved technical competence, regulatory compliance, and effective implementation of standardised testing procedures (Gawor et al., 2021). Furthermore, the presence of postgraduate-qualified personnel strengthens analytical accuracy, method validation, and continuous improvement initiatives, which are essential for maintaining accreditation and ensuring reliable test results (Lawson and Ledesma, 2018).

© IEOM Society International

4.2. Customer Satisfaction

Customer satisfaction was evaluated using eight Likert-scale items. Overall, respondents reported high levels of agreement that customer satisfaction had improved following ISO/IEC 17025 accreditation. Approximately 96% of responses reflected positive agreement across the construct, indicating a strong culture of customer focus within the laboratory. Reliability analysis for this construct produced a Cronbach's alpha of 0.83**,** confirming good internal consistency (George and Mallery, 2003). While most indicators showed strong positive responses, turnaround time (TAT) received comparatively lower ratings, suggesting that accreditation alone did not uniformly resolve service speed challenges. These findings are consistent with prior studies indicating that ISO 17025 accreditation enhances customer trust and satisfaction, though operational constraints such as workload and process complexity may still affect timeliness (Sadikoglu and Temur, 2012; Okezue et al., 2020).

4.3. Quality performance

Quality performance indicators revealed a generally positive post-accreditation trend. Respondents reported improvements in: Quality culture, Management commitment, Control of non-conformances (Figure 4), Equipment management and Waste control practices. Management commitment to quality was rated as high or very high by over 85% of respondents, indicating strong leadership support for the QMS. The Cronbach's alpha for the quality performance construct was 0.75, which is considered acceptable for organisational research. Notably, management commitment to quality received strong agreement, with more than 80% of respondents indicating high or very high levels of commitment. This finding underscores the critical role of leadership in sustaining ISO 17025 requirements and embedding quality objectives into daily laboratory operations (Geronimo et al., 2020; Maruta, Matu and Moyo, 2024).

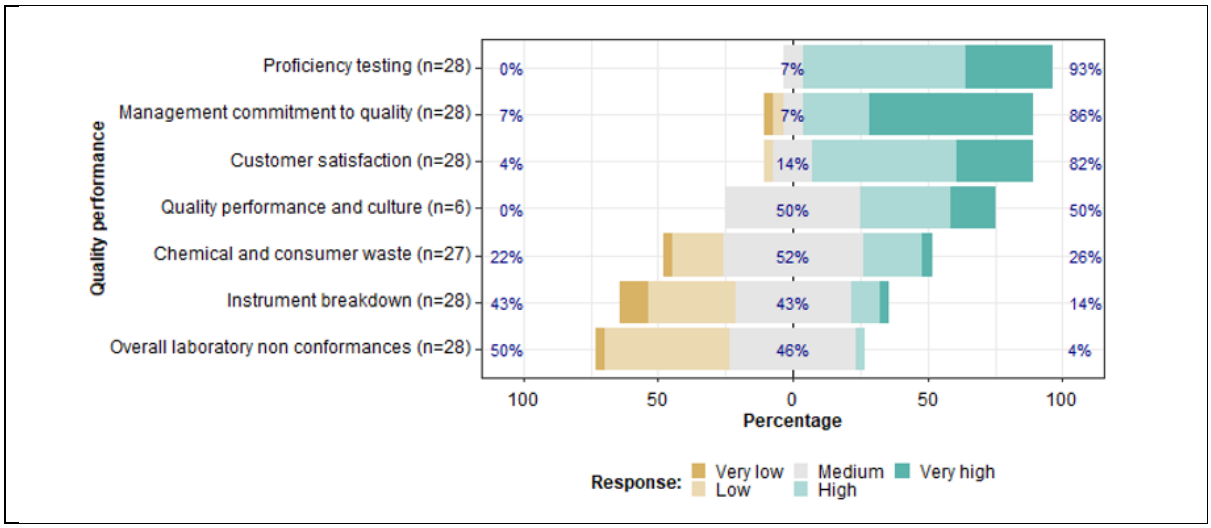


Figure 4. Customer satisfaction

Respondents further indicated positive outcomes related to equipment management and reliability, with fewer instrument breakdowns reported compared to the pre-accreditation period. Although some respondents rated equipment downtime as moderate, the majority acknowledged improvements attributed to enhanced calibration schedules, maintenance controls, and documentation practices mandated by ISO 17025 (Gawor et al., 2021).

In terms of proficiency testing performance, staff perceptions suggested greater confidence in testing outcomes and increased awareness of quality requirements. However, analysis of Z-score data from Food Analysis Performance Assessment Scheme (FAPAS) and Laboratory of the Government Chemist (LGC) proficiency testing schemes showed that performance remained largely within acceptable limits both before and after accreditation, indicating that accreditation primarily reinforced consistency and governance rather than producing immediate measurable gains in technical accuracy. This finding aligns with previous studies showing that ISO 17025 accreditation often stabilises already-competent laboratory systems rather than dramatically altering proficiency outcomes (Sadikoglu and Temur, 2012; Hajek et al., 2023).

Improvements were also observed in the control of non-conformances, with respondents reporting that most non-conformances were identified early and addressed through formal Root Cause Analysis (RCA). The laboratory's structured approach to documenting, investigating, and resolving non-conformances reflects effective

© IEOM Society International

implementation of ISO 17025 corrective and preventive action requirements and supports ongoing system improvement (Mukungu et al., 2021; ISO, 2017).

4.4. Non-conformances

Data derived from the questionnaire showed that non-conformances were largely perceived as low to moderate, with most respondents indicating a reduction in their frequency after ISO 17025 accreditation. Interview findings supported this trend, highlighting a cultural shift towards open reporting of non-conformances without fear of victimisation and systematic investigation using Root Cause Analysis (RCA). These findings align with evidence that structured quality systems encourage learning-oriented responses to errors rather than blame (Mukungu et al., 2021; Geronimo et al., 2020).

4.5. Proficiency testing performance

Proficiency testing results from FAPAS and LGC schemes were analysed using Z-scores, comparing pre- and post-accreditation performance. The results showed that the laboratory consistently achieved Z-scores within the acceptable range ($-2 \leq Z \leq +2$) both before and after accreditation.

Although respondents perceived improved confidence and oversight in proficiency testing post-accreditation, the empirical data indicated no statistically significant change in performance, as the laboratory was already operating within acceptable limits prior to accreditation. This suggests that ISO 17025 accreditation primarily reinforced consistency and governance, rather than producing immediate measurable gains in proficiency outcomes (Hajek et al., 2023; Schober, Mascha and Vetter, 2021).

4.6. Use of Quality tools

Respondents reported extensive use of quality tools, with the most frequently applied being: Root Cause Analysis (96%), Brainstorming (93%),Control charts (75%) and Cause-and-effect diagrams (64%). Less frequently used tools included Kaizen and Pareto analysis. The dominance of RCA reflects compliance with ISO 17025's emphasis on corrective and preventive action (ISO, 2017; Maruta et al., 2024). The findings indicated that the effective use of quality tools played a central role in supporting the implementation and maintenance of the ISO/IEC 17025:2017 quality management system within the PPECB testing laboratory. Majority of respondents reported regular use of structured problem-solving and quality improvement tools, with RCA identified as the most extensively applied tool. RCA was primarily used to investigate non-conformances, customer complaints, and failed proficiency testing results, enabling the laboratory to identify underlying causes and implement corrective and preventive actions. This aligns with ISO 17025 requirements, which emphasise systematic investigation and continual improvement of laboratory processes (ISO, 2017).

Overall, the results showed that the strategic application of quality tools has reinforced compliance, reduced recurrence of non-conformances, and supported continuous improvement, thereby contributing positively to the laboratory's operational performance after ISO/IEC 17025:2017 accreditation (Sadikoglu and Temur, 2012; Maruta, Matu and Moyo, 2024).

5. Conclusion and Recommendations

This paper set out to examine the relationship between ISO/IEC 17025:2017 accreditation and operational performance within the PPECB testing laboratory. The findings showed that accreditation had a clear positive influence on several critical dimensions of laboratory performance. Notable improvements were observed in customer satisfaction**,** quality culture**,** management commitment**,** employee involvement, and non-conformance control, confirming that ISO 17025 functions as an effective framework for strengthening laboratory quality management systems (ISO, 2017; Geronimo *et al.*, 2020).

Customer satisfaction results indicated enhanced confidence in laboratory outputs, improved communication, and reduced customer complaints following accreditation. These outcomes aligned with earlier studies suggesting that ISO-accredited laboratories benefit from increased customer trust and perceived service reliability (Sadikoglu and Temur, 2012; Okezue *et al.*, 2020). However, improvements in turnaround time were less pronounced, highlighting that accreditation alone did not automatically resolve all operational efficiency constraints.

The paper further revealed that the management of non-conformances improved after accreditation, supported by a structured reporting culture and widespread use **of** Root Cause Analysis**.** This approach reflects ISO 17025's emphasis on corrective and preventive actions and contributes to a reduction in the recurrence of quality failures (Mukungu *et al.*, 2021; ISO, 2017).

© IEOM Society International

Analysis of proficiency testing results showed that laboratory performance consistently remained within acceptable Z-score limits both before and after accreditation. This suggested that while the laboratory was already technically competent, ISO 17025 enhanced process discipline, standardisation, and governance**,** rather than producing dramatic changes in analytical accuracy. This finding is consistent with literature indicating that accreditation often consolidates existing competence rather than generating immediate technical gains (Sadikoglu and Temur, 2012; Hajek *et al.*, 2023).

Overall, the findings confirm that ISO/IEC 17025:2017 accreditation contributes substantially to sustainable operational performance by embedding quality principles, strengthening organisational discipline, and promoting continuous improvement.

References

Amirrudin, M., Nasution, K., and Supahar, S., Effect of variability on Cronbach alpha reliability in research practice, *Jurnal Matematika, Statistika dan Komputasi*, vol. 17, no. 2, pp. 223–230, 2020.

Andargie, A. A., Challenges of ISO/IEC 17025 accreditation in testing laboratories, *International Journal for Quality Research*, vol. 13, no. 3, pp. 753–770, 2019.

Bagodi, S. G., Role of accreditation in reducing technical barriers to trade, *International Journal of Quality Infrastructure*, vol. 5, no. 1, pp. 45–56, 2020.

Barradas, S. and Sampaio, P., ISO 9001 and ISO/IEC 17025 integration: Benefits and challenges, *Total Quality Management & Business Excellence*, vol. 28, no. 13–14, pp. 1516–1532, 2017.

Chountalas, P. T., Magoutas, A. I., and Zografaki, E., Excellence in manufacturing through ISO-based quality management systems, *The TQM Journal*, vol. 32, no. 3, pp. 409–429, 2020.

Creswell, J. W., Research design: Qualitative, quantitative and mixed methods approaches (3rd ed.), *Sage Publications*, 2009.

Creswell, J. W. and Plano Clark, V. L., Designing and conducting mixed methods research (3rd ed.), *Sage Publications*, 2018.

Dawadi, S., Shrestha, S., and Giri, R. A., Mixed-methods research: A discussion on its types, challenges and criticisms, *Journal of Practical Studies in Education*, vol. 2, no. 2, pp. 25–36, 2021.

Etikan, I., Musa, S. A., and Alkassim, R. S., Comparison of convenience sampling and purposive sampling, *American Journal of Theoretical and Applied Statistics*, vol. 5, no. 1, pp. 1–4, 2016.

Fife-Schaw, C., Survey research, in G. M. Breakwell et al. (Eds.), *Research Methods in Psychology* (5th ed.), Sage Publications, pp. 187–220, 2020.

Gawor, M., Bernat, P., and Piwowar, A., Human capital and competence in accredited laboratories, *Accreditation and Quality Assurance*, vol. 26, no. 4, pp. 231–240, 2021.

George, D. and Mallery, P., SPSS for Windows step by step: A simple guide and reference (4th ed.), *Allyn & Bacon*, 2003.

Geronimo, A. L. et al., Management commitment and quality performance in accredited laboratories, *Total Quality Management & Business Excellence*, vol. 31, no. 5–6, pp. 593–610, 2020.

Gupta, M. and Sehgal, S., Workforce demographics and quality management performance, *The TQM Journal*, vol. 33, no. 6, pp. 1375–1390, 2021.

Hajek, P., Henriques, R., Castillo, E., and Sidorova, A., Accreditation effects on laboratory proficiency testing outcomes, *Accreditation and Quality Assurance*, vol. 28, no. 2, pp. 123–134, 2023.

Harzli, A. S., Perceived versus measurable benefits of ISO accreditation, *International Journal of Productivity and Performance Management*, vol. 70, no. 5, pp. 1105–1123, 2021.

International Organization for Standardization, ISO/IEC 17025:2017—General requirements for the competence of testing and calibration laboratories, *ISO Standard*, 2017.

Kaydos, W., Operational performance metrics (2nd ed.), *CRC Press*, 2020.

Lawson, R. and Ledesma, R., Competence and education in laboratory accreditation, *Journal of Laboratory Quality Assurance*, vol. 10, no. 3, pp. 145–154, 2018.

Maruta, R., Matu, Z., and Moyo, T., Quality tools and continuous improvement in accredited laboratories, *The TQM Journal*, vol. 36, no. 1, pp. 112–128, 2024.

McCrudden, M. T. and McTigue, E. M., Implementing mixed methods research, *Educational Psychology Review*, vol. 31, no. 3, pp. 723–744, 2019.

Merimi, E. et al., Cost and implementation challenges of ISO/IEC 17025, *Accreditation and Quality Assurance*, vol. 25, no. 6, pp. 345–354, 2020.

Mukungu, C. et al., Root cause analysis and nonconformance management in laboratories, *Quality Engineering*, vol. 33, no. 4, pp. 620–633, 2021.

Okezue, C. O. et al., Quality management systems and laboratory performance, *International Journal of Quality & Reliability Management*, vol. 37, no. 3, pp. 409–428, 2020.

© IEOM Society International

Panagiotidou, S. et al., ISO accreditation and organisational performance, *Total Quality Management & Business Excellence*, vol. 35, no. 3–4, pp. 412–429, 2024.
Panagiotidou, E., Chountalas, P. T., Magoutas, A. I., Georgakellos, D. A., and Lagodimos, A. G., Systematic identification and validation of critical success factors for ISO/IEC 17025 implementation, *Administrative Sciences*, vol. 15, no. 2, p. 60, 2025.
Perishable Products Export Control Board, Annual report, *PPECB Technical Report*, 2015.
Radev, D., Accreditation as a tool for conformity assessment, *Accreditation and Quality Assurance*, vol. 23, no. 2, pp. 89–98, 2018.
Rao, P., Quality management systems, *McGraw-Hill*, 2021.
Rodriguez-Arnaldo, O. and Martínez-Lorente, A. R., ISO standards and operational excellence, *The TQM Journal*, vol. 33, no. 2, pp. 269–286, 2021.
Ross, S. and Neuteboom, P., Accreditation, compliance and performance trade-offs, *Journal of Quality Management*, vol. 29, no. 1, pp. 55–69, 2022.
Sadikoglu, E. and Temur, D., The relationship between ISO certification and performance, *Journal of Business Economics and Management*, vol. 13, no. 3, pp. 477–492, 2012.
Saunders, M., Lewis, P., and Thornhill, A., Research methods for business students (5th ed.), *Pearson*, 2009.
Saunders, M., Lewis, P., and Thornhill, A., Research methods for business students (8th ed.), *Pearson*, 2019.
Schober, P., Mascha, E. J., and Vetter, T. R., Statistics in quality performance evaluation, *Anesthesia & Analgesia*, vol. 132, no. 6, pp. 1554–1563, 2021.
Somerville, I., Public relations and organizational communication, *Routledge*, 2014.
Wagh, P., Administrative burdens of laboratory accreditation, *International Journal of Quality Infrastructure*, vol. 8, no. 1, pp. 77–90, 2023.
Yuldashov, F., Systems thinking in quality management, *Systems Research and Behavioral Science*, vol. 38, no. 2, pp. 241–253, 2021.

Biographies

Gcinumuzi Zimu holds a National Diploma in Analytical Chemistry, a BTech in Quality Management, and is currently pursuing an MPhil in Quality Management. He is a seasoned Quality and Analytical Chemist with over 20 years of experience in food laboratory environments, FMCG, and export industries. He currently serves as Laboratory Manager at Ingrain, overseeing laboratory operations, quality systems, and continuous improvement. Gcinumuzi is highly experienced in ISO/IEC 17025, method validation, accredited laboratory systems, and has served as a SANAS Technical Signatory for seven years.

Prof. Shalini Singh is an Associate Professor in the Department of Operations and Quality Management at the Durban University of Technology. Her qualifications are in Chemistry, Quality and Nanotechnology, obtained from DUT and the University of Oxford. She has also lectured at Universities in Switzerland, Germany and India. Prof Singh has published several chapters of books and manuscripts in accredited academic journals, and presented at conferences in Air pollution, Quality, Nanotechnology and Research Methodology, nationally and internationally.

Dr. Anisha Ananth holds a BSc in Applied Mathematics and Statistics, an MSc in Quantitative Finance, and a PhD in Education specialising in statistics pedagogy. Her early career focused on financial statistics, including financial mathematics, econometrics, and risk modelling. Since 2020, her research has centred on statistics education, informed by her doctoral work on threshold concepts in introductory statistics. Her published research contributes to statistics education, particularly within developing-country contexts, and she remains committed to advancing applied statistics and teaching.

© IEOM Society International