Enhancing Quality Assurance Practices for Defect Reduction in Landed Residential Building Construction at Johor Bahru

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KEYWORDS	ABSTRACT
Quality Assurance Construction Defects ISO 9001 QLASSIC BIM Johor Bahru	Persistent quality issues in Malaysia's residential construction particularly in Johor Bahru are continue to challenge industry standards despite the adoption of Quality Assurance (QA) frameworks such as ISO 9001 and QLASSIC. Therefore, this study initiates to address this gap by examining the relationship between defect factors and the implementation of QA strategies aimed at enhancing construction quality and minimizing rework. Using a quantitative research design, questionnaires will be distributed to key industry practitioners to gather data on current QA practices and defect occurrences. The study will aim to identify the major factors contributing to defects, including workmanship quality, material compliance, and the effectiveness of site supervision. It will further explore how strategic QA practices such as systematic inspections, staff competency training, and the adoption of digital monitoring technologies can improve construction performance. By proposing the harmonization of formal QA systems with on-site implementation, this study is anticipated to offer practical insights for policymakers, contractors, and developers. Ultimately, the findings are expected to contribute substantially to the sustainable advancement of construction quality management in Malaysia's residential sector, thereby supporting the nation's broader goals of productivity, reliability, and client satisfaction within Malaysia's residential construction industry.

1. INTRODUCTION

The construction industry in Malaysia, particularly in Johor Bahru continues to face persistent quality challenges despite the widespread adoption of quality management systems such as ISO 9001, Total Quality Management (TQM), and the Quality Assessment System in Construction (QLASSIC). Quality Assurance (QA) serves as a process-based framework designed to prevent defects through standardization, effective supervision, and continuous improvement across all stages of a project, from design to handover [1]. Unlike Quality Control (QC), which primarily focuses on detecting and rectifying defects, QA emphasizes proactive prevention, comprehensive documentation, and accountability throughout the project lifecycle.

Johor Bahru has been chosen due to its rapid development as a major residential construction hub, fueled by the growth of the Iskandar Malaysia region. However, recurring construction defects such as water leakage, structural cracking, and poor finishing continue to undermine housing quality and customer satisfaction [2]. These persistent issues suggest that existing QA mechanisms are not being implemented effectively at the project level.

Recognizing that efficient QA practices can substantially reduce rework costs estimated between 2% and 12% of total project value meanwhile simultaneously improving client confidence, safety, and sustainability [3], this

proposed study aims to investigate the current shortcomings in QA implementation. It will further propose strategic improvements tailored to the specific needs and challenges of the landed residential construction sector in Johor Bahru.

2. QUALITY ASSURANCE (QA) IMPLEMENTATION

Despite the establishment of comprehensive Quality Assurance (QA) frameworks in Malaysia, the construction industry continues to record high defect rates during the Defect Liability Period (DLP), especially in residential developments. Recurring issues such as water leakage, wall cracking, and electrical faults highlight persistent weaknesses in workmanship quality, site supervision, and inspection practices [4]. In Johor Bahru, the average QLASSIC scores consistently fall below the national benchmark of 80%, indicating poor consistency and weak enforcement of QA standards [2].

The underlying challenge stems from a fragmented and compliance-driven approach to QA, where many contractors treat it as a procedural requirement rather than a strategic, integrated system for continuous quality enhancement [5]. The situation is compounded by the slow adoption of digital tools such as Building Information Modelling (BIM), mobile QA applications, and cloud-based inspection systems largely due to limited financial resources and low digital competency among practitioners

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[6]. Weak accountability mechanisms within project teams further aggravate the problem, resulting in inadequate documentation, poor communication, and defects that often surface only after occupancy.

Quality assurance plays a pivotal role in ensuring that constructed assets meet performance standards and deliver long-term durability. However, in Malaysia's landed residential sector, frequent defect occurrences continue to compromise customer satisfaction, project value, and industry reputation [7].

Meanwhile, QA frameworks such as ISO 9001 and QLASSIC provide structured guidelines, their true effectiveness depends on proper implementation, supervision, and continuous improvement. Many industry players still pursue these certifications merely for compliance or marketing purposes, rather than as tools for genuine performance management [8].

Therefore, this study is highly significant as it aims to bridge the gap between formal QA standards and on-site execution through an integrated approach focusing on systematic process management, enhanced stakeholder competency, and digital integration. By identifying key weaknesses and proposing data-driven improvement strategies, the research will contribute to elevating construction quality, reducing rework costs, and fostering a culture of accountability and excellence within Malaysia's residential construction industry particularly in Johor Bahru. The study will be directed by the following objectives:

i. To identify the most significant defect elements and quality assurance implementation strategies in landed residential construction.
ii. To discover the relationship between the defect elements and quality assurance implementation strategies towards the improvement of quality assurance practices in landed residential construction.
iii. To make a recommendation on the effectiveness of quality assurance implementation strategies in landed residential construction.

3. METHODOLOGY

This study will adopt a quantitative research methodology to investigate the relationship between Quality Assurance (QA) implementation strategies and defect reduction in landed residential construction projects within Johor Bahru. The methodological design aligns with the study's aim to bridge the gap between formal QA frameworks and on-site execution through systematic process management, enhanced stakeholder competency, and digital integration.

Structured survey questionnaires will serve as the primary data collection instrument. These will be distributed to key industry professionals including project managers, QA/QC officers, engineers, and site supervisors who possess direct experience in QA implementation and defect management. The stratified random sampling technique will be employed to ensure that respondents are selected stratified based on their relevant expertise and involvement in quality-related decision-making processes.

Collected data will undergo descriptive statistical analysis to identify and prioritize the most significant defect elements and QA implementation factors. Inferential statistical methods, particularly correlation and regression analyses, will then be applied to determine the strength and nature of the relationships between QA strategies such as supervision, training, documentation, and digital adoption and defect reduction outcomes.

In addition, the study will develop a conceptual framework that integrates key QA components, including training, supervision, documentation, inspection, and feedback mechanisms, to demonstrate their collective impact on construction quality performance. This structured and evidence-based approach is expected to generate analytically robust and practically relevant findings that can guide policymakers, contractors, and developers in enhancing QA governance and fostering a culture of continuous quality improvement in Malaysia's residential construction sector.

4. EXPECTED OUTCOMES

The anticipated outcomes of this research are multifaceted, aiming to deliver both academic and practical contributions to Malaysia's construction industry. Firstly, the study is expected to identify and categorize the most critical defect factors that frequently occur in landed residential construction projects. By compiling a comprehensive and evidence-based profile of recurring defects, the research will provide valuable insights for contractors, developers, and regulatory bodies to design more targeted and preventive Quality Assurance (QA) interventions. A clearer understanding of these high-risk defect areas will enable industry practitioners to allocate resources more effectively, minimize rework, and enhance overall construction productivity and efficiency.

Secondly, the study will develop an enhanced QA framework that systematically links key QA components such as supervision, training, documentation, inspection, and digital integration to measurable defect reduction strategies. Contextualized specifically for the Malaysian construction environment, particularly within the rapidly developing Johor Bahru region, this framework will serve as a practical model for integrating proactive QA measures into day-to-day construction operations. It will also support compliance with national standards such as ISO 9001 and QLASSIC while encouraging continuous improvement beyond certification.

Thirdly, the research will generate strategic policy and management recommendations to strengthen QA governance and elevate industry performance. These recommendations will guide the Construction Industry Development Board (CIDB), developers, and contractors in improving workforce competency, refining documentation and supervision procedures, and enhancing regulatory enforcement mechanisms. Furthermore, the study will highlight the significance of adopting digital tools such as Building Information Modelling (BIM), mobile QA applications, and cloud based inspection systems to promote real-time quality monitoring, transparency, and data-driven decision-making.

Finally, the broader significance of this study lies in its potential to deliver long-term socioeconomic benefits. By reducing rework costs, improving client satisfaction, and embedding a culture of continuous quality improvement, the research aims to position Johor Bahru as a benchmark for excellence in landed residential construction.

In the long run, the outcomes of this study will contribute to Malaysia's national housing sustainability agenda by fostering a construction industry that prioritizes quality, accountability, and operational efficiency.

5. CONCLUSION

In conclusion, this proposed study underscores the critical need to strengthen Quality Assurance (QA) practices as a means to effectively reduce construction defects in landed residential projects within Johor Bahru. Although QA frameworks such as ISO 9001 and QLASSIC have been introduced to enhance construction quality, recurring defects continue to surface due to fragmented implementation, insufficient supervision, and limited adoption of digital technologies.

This research will address these challenges by developing an enhanced QA framework that integrates key elements such as systematic process management, workforce competency development, and digital-based quality monitoring. The framework aims to establish a direct linkage between QA strategies and measurable defect reduction, thereby providing a practical and evidence-driven tool for contractors, developers, and regulatory authorities.

The anticipated findings will offer valuable insights for improving QA governance, strengthening staff training programs, and promoting technology-driven inspection and documentation systems. More importantly, the study aspires to cultivate a proactive culture of defect prevention moving the industry away from reactive rectification toward continuous quality improvement.

Ultimately, this research contributes to the advancement of sustainable construction practices in Malaysia by positioning Johor Bahru as a model for high-quality residential development. It supports national aspirations for a more reliable, efficient, and accountable construction industry that prioritizes long-term performance, client satisfaction, and sustainability.

ACKNOWLEDGEMENT

REFERENCES

[1] Ghansah, P. R., Ameyaw, C., & Kumi, E. (2024). Digital technologies in quality assurance: Applications and barriers in residential construction. International Journal of Construction Technology and Management, 12(1), 45-59.

[2] Construction Industry Development Board (CIDB). (2020). Analysis of Defects CIS 7 & QLASSIC 2015– 2018. Kuala Lumpur: CIDB Malaysia.

[3] Gayani, K., Fernando, P., & Jayasinghe, C. (2025). Effect of construction defects on waste management in building construction. Integrated Environmental Assessment and Management

[4] Ashraf, N. (2023). Common defects in public institutional buildings in Malaysia. Journal of Sustainability Science and Management, 18(3), 35–52. 21(2), 112–124.

[5] Paul, D. (2024). Challenges of implementing quality assurance in construction projects: A developing country perspective. Journal of Construction Management and Economics, 42(4), 278–289.

[6] Shaban, A., Lim, T. Y., & Noor, H. M. (2024). AI-assisted defect detection and BIM integration for construction quality assurance. Construction Informatics Journal, 9(2), 66–81.

[7] Olanrewaju, A. L., & Lee, A. H. J. (2022). Investigation of poor-quality practices on building sites in Malaysia. Organization, Technology and Management in Construction: An International Journal, 14(1), 2373–2385.

[8] Rahman, R. A., & Ismail, S. (2016). Barriers in implementing quality assurance systems in Malaysian construction projects. Built Environment Journal, 13(1), 45–5